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By K. H. Condit
Editor, American Machinist

From an interview with
Paul C. DeWolf
Vice-President,
Brown & Sharpe Manufacturing Company

Fulfilling Replacement Promises

A machine tool builder modernizes equipment conservatively but consistently

"Well, how do you find things?"

"Fair enough, but I certainly run up against some pretty tough customers these days. I was up in a machine tool plant north of here yesterday They said they were glad to see me, but that of course they were not buying machine tools any more than Brown & Sharpe was. And I didn't have any comeback."

"But, look here. Here are orders for fifteen new machine tools that I am just taking to the purchasing agent to be put through. Brown & Sharpe cannot afford to stop a replacement program just because business slacks off a bit."

The foregoing is a rough paraphrase of a conversation between Mr. DeWolf and a Brown & Sharpe salesman that took place just outside the door of a room where a sales meeting was in progress.

The effect on the salesman was electric. Confidence returned in a flood.

"Is that really so? Just wait 'til the next fellow pulls that one on me. I'll have something to say to him."

But these fifteen machines were but a small part of those already ordered for replacements. To date, this year, 67 new machine tools, all replacements of worn or obsolete equipment, have been ordered, and the program calls for future replacements as fast as they are found necessary.

Other machine tool builders have the same or similar policies, and examples could be chosen from many plants. But, to give point to this story, only the practice of Brown & Sharpe will be cited.

On Mr. DeWolf's staff is an equipment supervisor, G. H. North. His responsibility it is to know every

machine tool in the Providence plant, how old it is, what it is costing for repairs, how often it is being repaired, how much "down" time is chargeable to it, and whether it should be replaced.

Mr. North does not have any set budget of equipment or money. He acts solely as a disinterested expert. If he recommends a replacement it is up to the management to decide, from the financial standpoint, whether that replacement shall be made. His judgment is consequenty not affected by expediency, but is based on the merits of a particular machine and the one that might supersede it.

Similarly, the plant engineer, Mr. E. W. Freeman, recommends replacements in the foundry and hardening room after consultation with the respective superintendents. Both of these departments have been largely re-equipped during the last two years. Many hand operations are performed by machines, and the saving has been appreciable. Quality has been much improved through the closer control made possible by modern equipment. One installation, in fact, was made because of the possibility of improving quality, even though it did not quite promise the money saving which was thought necessary by the management.

In his study of the machine tool equipment, Mr. North is listing all machines on sheets headed like this:

Type and Make	Shop No.	Location in plant	1890 to 1900	1900 to 1910	1910 to 1920	1920 to 1930

With this list, which might be for milling machines, he visits each machine listed and decides whether it should be retained or replaced. In arriving at his decision he takes into account the location of the machine.

FOR instance, in a production department a machine must not only be satisfactory as to alignment and general condition, but it must also have adequate power to permit the use of modern cutters. The average age of machines in the production departments is far less than that of machines in the assembling and erecting departments.

In the assembling and erecting departments accuracy is important, but power is secondary because the cuts are generally light. Consequently it may pay to have a good old machine rescraped and otherwise reconditioned, where it would be foolish to do the same for a production machine.

In these departments the machine tools are often used for touching up and other minor operations. Here the main consideration is that there be enough machines so that assemblers will not have to wait a turn at one. Such machines may be used but two or three times a day, and it would therefore be economically impossible to justify the installation of new ones.

Other old machines are equipped for special jobs and are never used for anything else. Here again the machine may be idle 90 per cent of the time yet justify its existence by being ready when this one particular job must be done. Generally speaking, it is very difficult to justify a replacement where the new machine can only operate ten per cent of the time, or less.

Some machine tools are recommended for replacement even though they are not old, nor obsolete. Occasionally a machine will be dogged by hard luck, another name for carelessness. Or it may be abused by being called upon constantly for jobs beyond its rated capacity. In either case excessive repair costs and "down" time result, and replacement is recommended.

In reviewing the policy just outlined it should be remembered that in this plant, as in most machine tool plants, large lots are scarce. Consequently, elaborate tooling is seldom justifiable and requirements entirely fair in a mass production shop would be quite unfair here.

In this case the management has decided that it will not be satisfied to stand the losses occasioned by obsolete equipment, and it is continuing its replacement program regardless of variations in business. In other words, it is simply carrying out the policy recommended by various groups that met in Washington last fall at the request of President Hoover. If more companies would adhere to this eminently sound policy the existing depression, which is not as severe as many of us had feared, would be even less trying.

Testing Steel Sheet for Weldability

ONE of the fundamental considerations in the successful oxy-acetylene welding of sheet steel is careful selection of material. Inferior sheet is bound to produce an unsatisfactory result. Chemical composition alone is not a sufficient indication of the quality of steel sheet. Welding qualities are determined to a great extent by the presence or absence of minute amounts of impurities in the steel. This holds especially true for thin sheet steel. It is always advisable, therefore, to specify that a steel shall be suitable for welding, and as a further check to test lots of steel as they are received from the mill. Such a test is easily made in the following manner:

Select a piece of sheet from the lot, about 6 in. square, and place it flat on the welding table. Fit a welding tip to an oxy-acetylene blowpipe, one size smaller than that prescribed on the ordinary welding chart. Light the blowpipe and adjust the flame to neutral. Hold the blowpipe so that the tip of the inner cone of the flame is about $\frac{1}{8}$ in. from the sheet. The flame should then be moved slowly in a straight line so that the sheet is melted without burning clear through. After a strip of about 3 in. in length is melted in this way, the blowpipe is held still until a hole is burned through the sheet.

If the sheet is of high grade the path followed by the blowpipe will be free from an excess of oxide or scale and will be regular and smooth on the upper side. The under side of the sheet will show a slight sag of smooth metal, free from oxide. The hole will be round.

Sheets of inferior quality will show an oxide deposit on the upper side, part of which will be porous or flaky scale. There will also be a succession of irregular ripples, higher in the center than on the edges, and the under side will show a sag that is covered with oxide. There may even be a series of small holes blown through by the sparking action of the impurities. In poor sheet the metal will be burned through very soon after the blowpipe is held stationary, in much less time than is necessary to put a hole in good sheet. The hole, incidentally, will be irregular with rather ragged edges. When the test sheet cools the examination will disclose porous, spongy-looking globules of oxide on the edges of the hole.

This simple test, which can be made quickly on average samples selected from each lot of steel, provides assurance that the sheet is of the proper quality to make a high-grade product.

By Fred H. Colvin
Editor, American Machinist

Fig. 1—Main bay of the North Eastern University shop

Repairing Locomotives

In a University Shop in Mukden

Locomotive repairing is an unusual kind of work to find in shops connected with a university. And it is not quite understandable why the shops of the North Eastern University should be engaged in this work, except as a means of securing funds for the University. It is not a "school shop" in the usual sense of the word. Situated in the outskirts of Mukden it has extensive facilities very evidently built for handling the locomotive and car work of a number of small railroads in this section that have no facilities of their own.

An idea of the construction of the main shop can be had from Fig. 1, which shows the track pits, the deep trussed crane of German construction, and the location of the skylights. The machine equipment is entirely German with the exception of a Niles side-head boring mill and a Bridgeford lathe.

Fig. 2—Turning driving wheels on a German wheel lathe

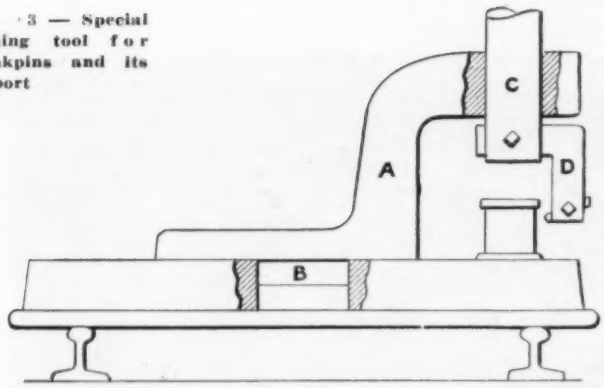
A German wheel lathe is seen in Fig. 2 and also the tires that are turned on it. The crane handles wheels in and out of lathe as shown.

Two interesting crankpin turning devices were also in use, but these, because of the poor light, could not be photographed satisfactorily. One is used on wheels that have been removed from the axle, the pins being re-turned under a large radial drilling machine. The wheel is supported on two pieces of rail, and the proper location is secured by means of the frame *A* which is adjustable for different crank-throws, although this is not indicated in the sketch. The distance from the center plate *B* to the spindle *C* determines the crank-throw. The method of turning is not new, but the usual tool of this kind is not so well supported and consequently cannot do as good a job. The cutting tool is held in the angle arm *D* that is driven by the spindle *C*. This spindle is guided by an adjustable taper bushing so as to insure a round crankpin and to avoid chatter.

The other device turns the crankpins on locomotives having outside or radial valve gear as well as a half-crank or return-crank solid on the main crankpin. In American practice this return crank is made removable. On the European locomotives in use on these roads in China, however, these return cranks are forged solid with the crankpin, which adds greatly to the difficulty of re-turning the crankpin after it is worn in service. The device shown in Fig. 4 was designed to aid in this work.

With the driving wheels supported suitably on the

Fig. 3 — Special turning tool for crankpins and its support



lathe carriage on blocks, as at A, so as to bring the crankpin *B* in line with the center of the lathe, the tool carrying frame *C* is slipped over the return crank so that the crank comes inside the tool carrying portion of the frame *D*, and the tool *E* between the crank and the driving wheel. The frame is then fastened to the face

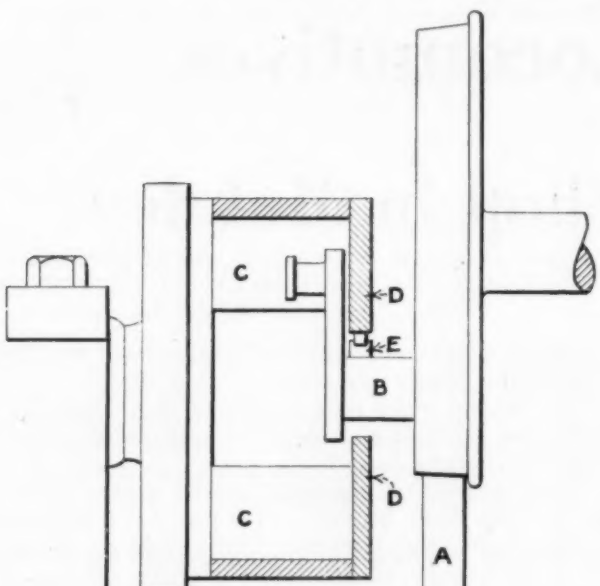


Fig. 4—Tool carrying frame to turn crankpins behind a fixed return crank

plate, its correct location being assured by suitable dowels. With the wheels rigidly held in position, it is an easy matter to re-turn the crankpin by means of the tool *E*, the wheels being fed toward or away from the headstock by the lathe carriage. The frame for carrying the tool is built up of boiler plate, welded in a partially circular form, and makes a light and rigid support for the cutting tool.

Air-brake apparatus is also tested and overhauled at this plant, a corner of the air-brake department being shown in Fig. 5. The shop is very complete, having its own foundry for both iron and brass castings.

Nearly all of the cars repaired are of the wooden type. The kind of equipment used is shown in Fig. 6, which also shows the end of one of the cars. The wood planer at the right is motor driven, and the motor is supported by channels bolted to the column of the building.

The car shop is in one of the low bays of the shop as shown in Fig. 7. This also shows the type of gantry crane used in handling material outside the shop. It is of interest to note that while the shop tries to use as much native wood as possible, it finds it more economical to import large quantities of Oregon pine on account of its being better seasoned. This is largely due to the lack of suitable dry kilns in Manchuria. I was informed that the only available dry kiln is, strangely enough, in the arsenal at the other side of the city. This, moreover, is fully occupied with its own work but could be duplicated at low cost.

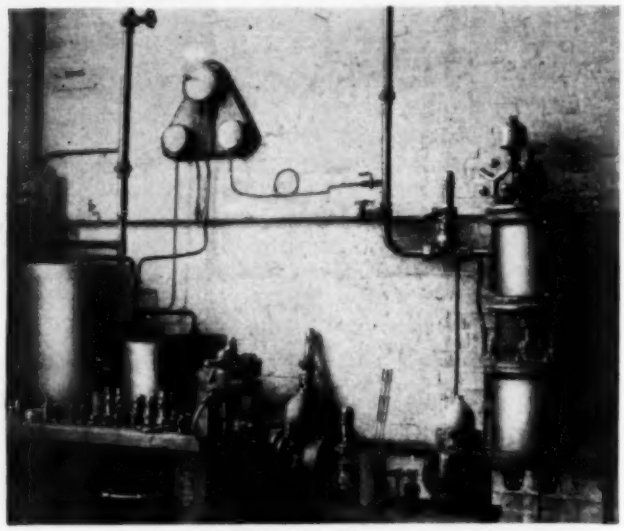


Fig. 5—A corner of the air-brake department

Fig. 6—In the wooden car repair department—note motor driven buzz planer

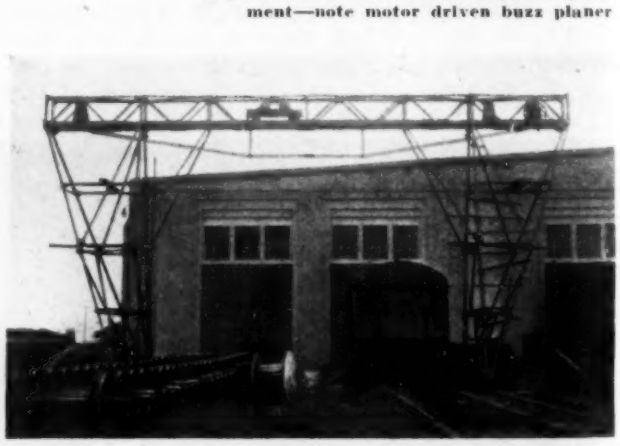
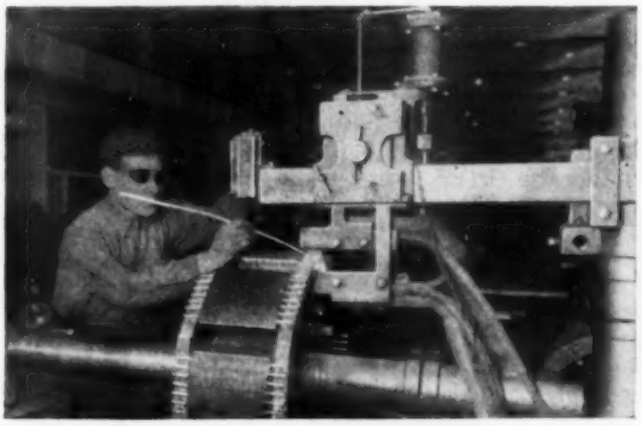


Fig. 7—Outside of car repair department with gantry crane for yards use

Copper connectors for motors and generators. Arrows indicate joints

Phosphor-Copper for Welding and Brazing



Brazing damper bars on a rotor using a phosphor-copper alloy

By C. J. SNYDER

Material and Process Engineering Department
Westinghouse Electric & Manufacturing Company

THE practicability of phosphor-copper alloys for brazing and welding has been demonstrated by experiments and practical shop processes covering a period of not less than 18 months. During that time many applications of these new brazing agents have been attempted, and unusual success has so far been experienced. The patent rights on the use of phosphor-copper for soldering, brazing, and welding were granted in 1927, but the application of technique needed much development before uniformly strong joints could be assured. Large quantities of these alloys are now, however, used daily in brazing or welding radiators, cooling coils, many parts of electrical equipment, and other apparatus. Phosphor-copper strips have replaced the more expensive silver solders on many kinds of work and have even replaced soft soldered joints on some applications.

The development includes: first, a process of manufacturing and fabricating the alloys into strip and wire suitable for shop work; second, the choice of the most suitable analysis of strip and wire for various types of work; third, the best processes of applying them; and fourth, the determination of the kinds of work in which these alloys produce dependable results. Each one of these points is of great importance in applying phosphor-copper to the best advantage.

Phosphorus and copper make useful alloys when the phosphorus content is less than 15 per cent. When the phosphorus exceeds that figure, a chemical compound is formed which has a high melting point and is very brittle, unmachinable, and unworkable. With an 8 per cent phosphorus content, a eutectic of the compound Cu_3P and solid solution of phosphorus in copper is formed with the low melting point of 707 deg. C. This eutectic makes possible the use of these alloys for brazing. It is very fluid and has unusual wetting, penetrating, and flowing properties. Phosphorus, being an extremely active element chemically, reduces oxides on the surfaces of the metals being joined and acts as a flux and cleaning agent. Some of the phosphorus is diffused into the metals comprising the joint, producing an effect similar to that of alloying with them. A strip of low-phosphorus alloy pressed between two bars of copper and heated acts very much like thin hot glue between two pieces of wood. The result is a strong, tough joint that cannot be broken apart.

The eutectic alloy is to some extent brittle, hard to work, and difficult to machine, but nevertheless produces a sound and tough deposit not quite as ductile as copper. It was feared that the deposit in a joint would also be brittle. This is not true, however, because this brittleness has been overcome by a careful selection of the composition of the alloys used. It was discovered in experiments that as the phosphorus content was reduced from 8 per cent, the alloy became more and more ductile and tough, and with successive reductions would approach the properties of deoxidized copper. Of course, it is assumed that to have tough joints the binding material in the joints should not be brittle, and therefore the phosphor copper deposit in the joints should have a reduced phosphorus content. It has been found that by starting with the proper composition the loss of phosphorus by diffusion into the surrounding metals and by volatilization, plus the fluxing action of phosphorus at the heat of brazing or welding, will reduce the percentage

of phosphorus remaining in the joint to a point where toughness is secured. Therefore, it has been found advisable to select alloys with as low an initial phosphorus content as possible, consistent with low melting point and good flowing properties.

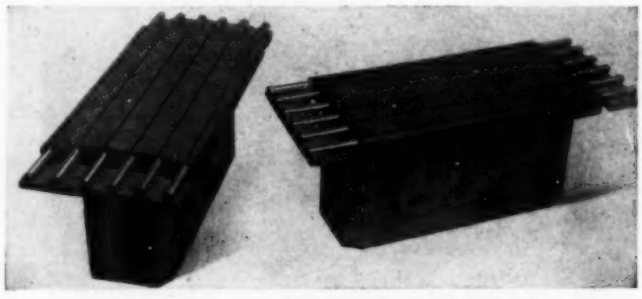
Though the melting point of the eutectic alloy is 707 deg. C., and the melting point of alloys lower in phosphorus is supposed to increase rapidly with a lesser amount of phosphorus, actual brazing practice does not show that to be the case. In fact, little or no increase in heat needed for melting is noticed in alloys containing 6½ to 8 per cent of phosphorus, and the same excellent flowing properties are present with the 6½ per cent alloy that are present with the eutectic. Alloys containing between 5½ and 6½ per cent phosphorus show fine fluidity at a slightly increased temperature, and alloys containing above 4 per cent phosphorus are very satisfactory for some work at the slightly increased temperature.

SINCE the alloys with lower phosphorus contents have the requisite properties for a brazing alloy, namely, low melting point, good fluidity, good wetting and penetrating properties, two alloys which can be used on most any type of brazing or welding work have been adopted as standard. The one contains from 6½ to 7½ per cent phosphorus and the other from 4½ to 5½ per cent. The former is of necessity produced in rod form and is used as a filler rod. This alloy when melted will flow extremely well, running in all directions from the spot at which it is applied. The 5 per cent alloy is not as fluid when melted and therefore is rolled into thin strips 0.015 in. thick for inserting in the joint when assembly is made. By placing a piece of the alloy in the joint no great flowing properties are needed. The 7 per cent alloy will lose phosphorus by volatilization when it is melted into a joint, and of course, both alloys will lose phosphorus by diffusion into the surrounding metal, so that strong tough joints will result.

The temperature best suited to braze with phosphor-copper alloys is from 750 to 825 deg. C. Joints can be made at lower temperatures with the 7 per cent alloy, but they will show a tendency towards brittleness, and a longer time will be required to have enough phosphorus penetrate the surrounding metals to cement them together properly. Higher temperatures are not productive of best results because of excessive oxidation. They also give a burned appearance. By referring to the melting point diagram of phosphorus and copper alloy, it may be thought that we are using much too low temperatures for melting alloys with the low phosphorus content specified. These figures are, however, the result of much development and are factors that help to produce the excellent results now being obtained consistently.

The recommended process for using these alloys can be stated briefly in the following manner: Thoroughly clean the surfaces to be joined. When possible, insert a piece of 5 per cent alloy strip approximately 0.015 in. thick, and a little larger than the surfaces to be joined in the joint, and heat to approximately 800 deg. C. until well melted. Additions of brazing alloy may be made around the outside of the joint when at the brazing temperature, if desired. Flux is not needed. The joint should be squeezed together when hot and held until redness is practically gone. Heating may be done with an acetylene torch or with incandescent carbons heated electrically.

When it is impractical or undesirable to place a piece of strip in the joint, the 7 per cent alloy rod should be used. No flux is needed for ordinary work, but powdered borax may help in cases where long slow heating with a torch has oxidized the metal around the joint. Heat the work to approximately 800 deg. C., at the same time applying the phosphor-copper as the metal comes up to temperature. The phosphor-copper alloy will run to all points that are sufficiently hot and will flow into the joint. Incandescent carbons, an acetylene torch, or a carbon arc may be used for heating. Excellent welds on deoxidized copper and bronze have been obtained



Brazed damper windings on the poles of a motor

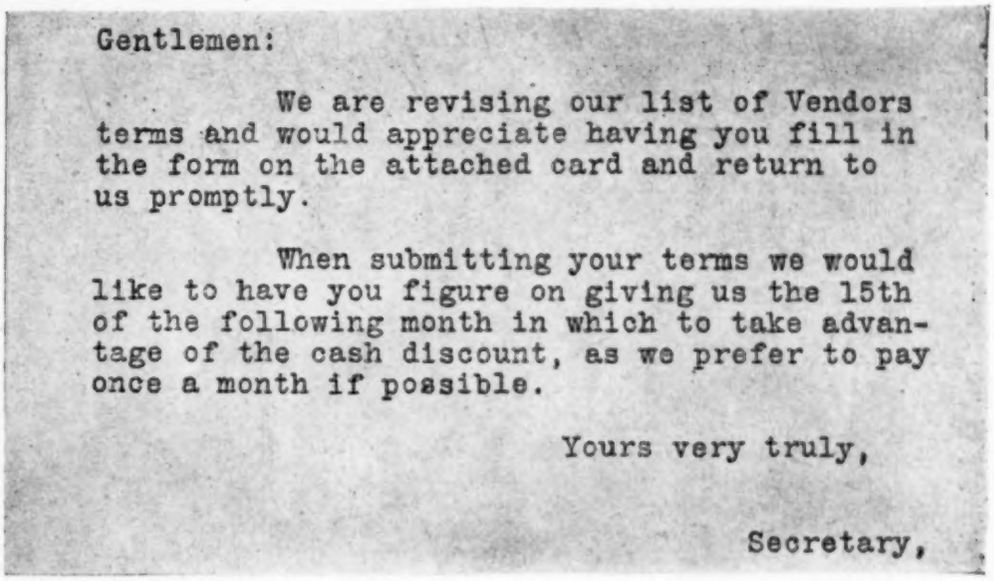
by using phosphor-copper welding rod as a filler rod with an arc from a carbon electrode.

Phosphor-copper is recommended for all brazing and welding of copper and almost all copper-base alloys. Better results are obtained on some alloys than on others, the best having been on phosphor bronze. Successful joints are being made between copper and copper, copper and brass, copper and bronze, bronze and bronze, bronze and brass, Everdur alloy and bronze, Everdur and copper, brass and brass, and cadmium-copper alloys and bronze. Successful joints have been made between Monel metal and copper, but they show a tendency to be brittle. The same can be said of brazing to steel. This brittleness is attributed to the diffusion of the phosphorus into the steel, making it brittle (cold short) and weak adjacent to the joint. It is supposed that all metals or alloys that are embrittled by alloying them with small percentages of phosphorus will become affected similarly. Careful tests should precede the use of phosphor-copper.

THE strength of properly made joints brazed or welded with phosphor-copper alloys will vary, depending on the type and quality of the joints, and on the materials being joined. To make a strong joint it is necessary that the parts be mechanically well fitted together, which is necessary for any welding, brazing, or soldering, no matter what material is used. This fitting is not always possible or practical, and some joints will be fitted better than others, so that variations in results are to be expected. The allowable stresses for any type of joint can be obtained only by experiment and test, using the minimum value out of about twenty tests. Discretion must be used in picking the minimum value, however, and the results of joints showing defects that are avoidable should not be included in the data from which the minimum is taken. It is considered that a joint which will withstand sufficient stress to cause yielding of the metal around the joint, or in other words, a stress greater than the yield point of the metal around the joint, is properly designed.

Because of the high temperatures necessary for brazing, the yield point of the parent metal adjacent to the joint will be approximately 4,000, 12,000, and 18,000 lb. per sq.in. for copper, brass, and bronze, respectively.

It has been found by test that a conventional butt joint in copper bars or wire brazed with phosphor-copper alloy will break at between 18,000 and 32,000 lb. per sq.in. of joint, depending on method of brazing, and size of wire or bar brazed. Lap joints, when tested in tension, which is a shear test on the joint, will withstand a stress of from 12,000 to 19,000 lb. per sq.in. of joint, depending on the material and the method of brazing. Joints in bronze withstand greater stresses than joints in copper and brass. Vibration and fatigue tests have been made on brazed joints and in no case have failures occurred in a joint that was properly designed as stated above. Electrical conductivity tests on phosphor-copper brazed joints have consistently shown conductivities approximately the same as those of soft soldered joints of equal area. Pressure tests have been made on cooling coils and radiator assemblies but have not been carried to destruction, so that no strength can be stated. No trouble has been experienced, however, in using such joints for handling light transformer oils and liquefied ammonia, sulphur dioxide, and other refrigerants now being used extensively.



Gentlemen:

We are revising our list of Vendors terms and would appreciate having you fill in the form on the attached card and return to us promptly.

When submitting your terms we would like to have you figure on giving us the 15th of the following month in which to take advantage of the cash discount, as we prefer to pay once a month if possible.

Yours very truly,

Secretary,

WHAT ARE YOUR TERMS?

FROM several hundred facsimiles of the modest card pictured above mailed during a recent periodic check-up of credit terms allowed to all the vendors supplying machinery, raw materials, and supplies to a certain outstanding manufacturer—have come a most amazing set of 464 replies. To those accustomed to regarding "net 30 days" as the U. S. Standard of credit terms, the tabulated returns will come as a distinct revelation.

Certain weak-kneed vendors will hail them as a justification for loose credit policies; those with sound products and the courage of their merchandising and credit convictions will read between the lines and infer that the lion's share of this particular company's business is going to those holding to strict credit terms. It must be recognized that a tabulation and listing of firm names would be unwarranted and unethical.

The following tabulation is taken direct from the "return cards":

10% 15th Prox.	1	5 % 30 days	1
5% 15th Prox.	3	1 % 30 days	1
2% 15th Prox.	109	1 % 15 days	1
1% 15th Prox.	54	5 % 10 days	3
½% 15th Prox.	5	2 % 10 days	68
2% 10th Prox.	12	1½% 10 days	1
1% 10th Prox.	3	1 % 10 days	39
½% 10th Prox.	1	½% 10 days	13
2% 20th Prox.	1	Net 15th Prox.	121
1% 10th & 25th Prox.	1	Net 10th Prox.	3
½% 10th & 25th Prox.	1	Net 30 days	22
		Total	464

Of 27 machine tool builders, included in the tabulation, 22 are to be commended, 13 of them holding firm to "Net 15th Prox.," and 9 to "Net 30 days." Five ranged from 2% 15 days to 1% 10 days.

Several other firms remarked on their return cards that they would quote "special terms on larger orders." Two firms spread themselves to okay every item from 5% 15th Prox. to 1% 10 days. There would appear to be plenty of spring and summer work ahead for the Credit Men's Associations of the United States and certain foreign countries.

EXECUTIVE · FORUM

Should Spending Be Influenced?

NO MATTER how rushed he was in other directions, Herbert L. Raymond, president of the Cummings Electric Company, spent an hour each week with his personnel director. He had long believed that the personnel department should be the pulse of the human side of his organization—that it should do more than carry on the routine of hiring and firing. Since his appointment of Richard Carlson as head of this department, Raymond felt that definite progress had been made in materializing his ideas. On this particular morning, the two were reviewing employment records together.

"Well this looks better," said Raymond, enthusiastically. "Our employment has increased sixteen per cent over last month and is only two per cent under the same month of last year. I attribute this wholesome recovery largely to the support of President Hoover's Program on Repairs, Replacements, and Betterments. It is a satisfaction to know that this company has done its share. We have augmented our replacement plans instead of deferring them. We profit by the improvement in plant physical condition, and we have aided in the stimulation of business."

"It has come to my attention that there is another way we can help," Carlson suggested. "We can take a step further by supporting this program individually as well."

"You know my ideas on the subject," agreed Raymond. "I am in favor of anything we can do to promote the cause of prosperity. What specific action have you in mind?"

"About the largest expenditure most of us make as individuals is the building of a home. Building and loan money is more plentiful now than it has been in some time. Conditions in this locality are unusually favorable for housing construction. I suggest the company take steps to encourage the immediate building of homes by its employees."

"Now you're getting on delicate ground," cautioned Raymond. "It is always dangerous to influence another man's pocketbook. He often resents any attempt to guide his expenditures, or he may be led to take a step which for him may not be entirely wise. Don't you feel that such a policy would let us in for a rather sizable responsibility?"

What Do You Think About This Executive Problem?

Is a company justified in stimulating purchases by its employees for the betterment of business as a whole? This policy has been followed by some concerns and has been found to have its advantages and defects.

Perhaps, from your personal experience, you are familiar with the results of this course of action. If so, other readers would be interested to know what you have learned. Contributions accepted by *American Machinist* on this subject will be paid for.

"We would not attempt to dictate a man's course of action—we would merely point out the advantages of building at this time," said Carlson. "This would show that personal profit could be combined with a real contribution toward business recovery."

"Suppose for example, we influence a man to make a major investment for a home and are later compelled to dismiss him," Raymond pointed out. "He may wish to move to another community, or he may be unable to continue payments on his property. Legally he has no claim on the company. But we have advocated a step which was not best for his individual needs. Don't you see the danger of officially influencing an employee's expenditures?"

"Yes, your objections are sound," agreed Carlson. "Still, I feel that such cases would be the exception. The aggregate effect of construction made on a sound basis should produce results which would overshadow the difficulties of a few individuals. I have the courage of my convictions and have just let the contract for a home of my own."

DISCUSSION

OF PREVIOUS PROBLEMS

Who Should Do the Firing?

Employees do not work for the personnel directors; immediately after being hired, they become the responsibility of the foremen in whose departments they are placed. While it is no longer necessary for a foreman to do his own designing, planning, purchasing, or hiring, and while he no longer has to punch submission into every new employee in order to maintain discipline and respect in his department, he is still forced to whip his organization into producing the required amount of the company's product.

Nearly every foreman is protected by countless safeguards, which are placed at his disposal, in order to aid him in meeting production schedules and maintain standards of quality. He has numerous labor-saving machines as well as assistants, inspectors, and maintenance men; in short, he has become a pivot man, or a center of information, while being forced to hold a position of line authority at the same time. Thus it should not be any more necessary for him to retain a worker who does not meet his requirements than it should be for him to use a broken down machine.

It is an inherent privilege of the foreman to rid himself of any employee who does not meet his standards, but it is not within his basic rights to dismiss any person entirely from the services of the company. Someone with a position similar to that of production manager should be best fitted to judge the matter of final dismissal.

—J. R. FREYERMUTH, *Production Engineer, Minneapolis-Honeywell Regulator Company.*

What Price Titles?

All too often the executive heads of a business try to placate some energetic and valuable employee with a high sounding title instead of recognizing his worth to them in the good old coin of the realm. Sooner or later such action will react to the disadvantage of those responsible; some one else seeing true worth will pay good money to secure the services of one whose employers were too niggardly to recompense justly. —GEO. R. MILLER.

Should Special Work Be Segregated?

One case in point, which occurs to the writer as applicable to that of the firm mentioned in the illustration, is one of the largest makers of electrical equipment in the world. This company considers their equipment to be obsolete at the end of a certain number of years, while it still has actually many years of useful life ahead of it in most cases. They have entered into agreements with reputable jobbing shops in each of several centrally located cities to take over all patterns, special tools, and stock peculiar to machines passing the arbitrary age limit, and all repair or replacement part orders for the machines in this class are passed directly to these outside concerns. Naturally, the deliveries are watched and the quality checked, but it is the exception when either requires criticism.

The idea of a separate department for all special work is a modification of the same plan, but it carries with it the necessity for substantial investment in equipment. Being in the same plant as the main shop, such a place is a constant temptation to production executives to use the equipment for regular work when rushed. —D. C. WRIGHT.

Who Should Do the Estimating?

The best scheme to get accurate estimates is by a combination of technical estimators and shop foreman. It is beyond the scope of the average foreman to compile complete estimates, because he does not know what percentages to add to cover all other charges.

Factors of importance overlooked, when the estimating office gives prices from previous figures on other work of similar nature, are:

1. Methods change rapidly; cutting speeds and feeds are constantly being boosted. Single tooling is changed to multiple tooling.
2. Unless the foreman is allowed to see the prints and give an estimate, he cannot plan ahead and use many existing tools and methods that he knows give the best results.

Since the foreman is held responsible for his estimate, he will see to it that he holds his end of the bargain, or down goes his prestige. Since he is paid to shoulder responsibility, why not give it to him? —C. L. HENRY, *Nottingham, England.*

What Price Titles?

Speaking in defense of American industry, I think that the practice of rewarding employees with titles rather than with salary increases is confined to isolated cases. I know of only one concern that tried out the experiment, and it is my understanding that they discontinued this practice because of its producing results opposite to what was expected. One of the minor results was to provide the non-participating members with a huge amount of enjoyment while the experiment was in progress.

It appears that the point overlooked was the tendency of human nature to live up to the highest standard provided by their salaries, and made necessary, in their opinion, by their position. An increase in title indicated to the world

an improvement of position. Trying to maintain this false position led to a condition commonly called "four-flushing." The type of man who would be content with this type of reward is not an asset to any live and wideawake concern.

—F. L. INGLERIGHT, *Superintendent, Bradford Motor Works.*

Should Salesmen Design?

As a concrete critic of specific designs, the salesman, if left to his own devices, merely reflects detail points he has heard from his customers, without perhaps, even knowing what idea was in back of the particular request. If, instead of being so specific, he brought forth the customer's real point in each instance, he would be a real help—for the designer in the engineering department can undoubtedly work out co-ordinated details better than any group of critics.

Therefore, I stand ready to agree that as a detail designer the salesman is usually a failure. But as a field representative of an engineering department, who can report intelligently the underlying criticisms of the user or consumer, I believe he is a truly valuable asset. Incidentally, if he will but be taught to do this, he will not only aid design, but he will also aid sales.

—CHARLES E. KIRKBRIDE, *Asst. Chief Draftsman, U. S. Naval Aircraft Factory.*

Should Estimates Be Given Operatives?

Estimates should not be given operatives, but the estimator should maintain sufficiently close contact with the various production aspects so he can work reliably and closely.

Most operatives know only their restricted bit. This matter of estimating is not a case where the arithmetical sum of the bits equals the whole. There is much more than this. Where there is doubt which of alternative means for machining a particular part of work is preferable and where there is a possibility of choice having to be made between the use of modern and obsolete equipment, the need for consultation with those representing the practical interests concerned is obviously indicated. In highly important cases it may require the ruling of the manager.

—W. R. NEEDHAM, *Stafford, England.*

Sales or Sincerity?

To hold the salesman responsible for promising deliveries a few days in advance of the shop's estimate would be placing him under a great handicap. He is no more anxious to promise expedient deliveries than the shop is to accept such orders and will usually get all the time he can. But when it comes to a case of promising advanced deliveries or losing an order, the salesman should be absolved from all responsibility. It is sometimes difficult for the man in the shop to appreciate the salesman's position. They agree that he is necessary to the success of the firm, and they are ready to kick should he fail to obtain sufficient orders to keep the machinery in operation, but if they are asked to exert themselves in order to land a new customer, well—that's a different question.

While it is true that strict reliability is a good policy, it is also true that expansion is desirable. How is the firm to expand if it is unwilling to go out of its way to accommodate a customer? There is of course a limit to the production of the shop, but when it takes a short delivery to gain a new customer the firm has been trying to land there is no room for argument.

—W. J. OWENS, *Foreman, Newport Rolling Mill Company.*

Is Budgetary Control a Cure-All?

There are many who admit the advantages of control by budget, and some who are willing to go so far as to make a budget; but few there are who will delay acquiring something wanted because of this same budget, unless it is enforced by some authority. Until it is so backed, so that some considerations must at least bend to its dictum, it can accomplish no good.

Most budgets fail because they are too easy to side-step, because the authority that set them up can also set them aside with little or no formality. Some fail because there is no daily, weekly, nor even monthly summing-up of expenditures in each classification.

Good intentions will never enforce a budget, and good budgets, unenforced, will never benefit any business. Eternal vigilance is the price of this benefit. —J. MALVERN BENJAMIN. *Consulting Engineer.*

Should Price or Payroll Be Cut?

Burden includes two distinct classes of expenses. The first class is composed of such items as heat, building depreciation, and insurance. The second class includes only the actual operating costs of the machines.

When business conditions are as indicated, it would be profitable to take on work as suggested at a figure which would be slightly in excess of the actual labor costs and the second class of burden costs. The excess would aid in paying that portion of the burden which persists regardless of operation and the figure quoted would be considerably below that which included the usual burden.

It might be advisable to quote a figure even lower than the above because it is always a good policy to keep a working force intact. Men do not care to take jobs which may not last long. Foremen and superintendents have an added problem when new men are hired. Also the cost of hiring and breaking in new men is of importance.

—CHARLES F. BARTH, JR., *Industrial Engineer.*

Machine Shop Extraordinary

TO THE QUEEN OF THE SEAS

Compactness, efficient arrangement, good working conditions, convenient location, all mark the shop of the new Lloyd express liner, the S. S. *Europa*

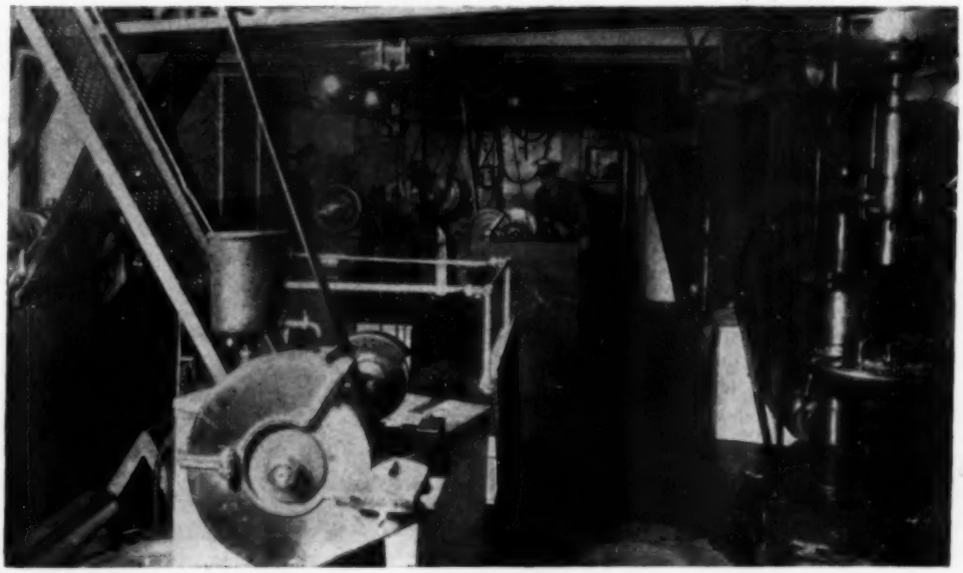
By E. J. TANGERMAN
Editorial Staff, American Machinist

SPEED and safety, as exemplified by the record-breaking North German Lloyd liners, *Europa* and *Bremen,* require for their final fulfillment something in addition to sound construction and scientific navigation—adequate repair facilities. This requirement leads one at once to the ship machine shop, for there it is that repair work must center while the ship is on the high seas.

The shop on the *Europa*—almost a twin to that on the *Bremen*—is placed well aft, its location being unusual in that it is at the center of the ship rather than at one side. Further, it is directly over the engine room, from which most of the repair jobs come, and communicates with it by means of the trapdoor which may be seen in the photographs. Repair jobs from either of the boiler rooms may be brought to the engine room easily, and thence to the shop.

In most ships, the machine shop is treated almost as a stowaway, and is given somewhat the same amount of consideration. It is sometimes a long, narrow, ill-lighted, and poorly ventilated room somewhere between bulkheads. In it the necessary machinery is crowded. More often still, "machine shop" is a polite term applied to nondescript machines sandwiched in with refrigerating and ventilating equipment.

But the *Europa's* shop contrasts sharply with such a description, for it is an adequate, well-lighted room, approximately 20x35 feet. Containing, as it does, the machines and men to take care of any mechanical emergency within the capacity of the machines, it appears, at first glance, small and crowded. A closer inspection

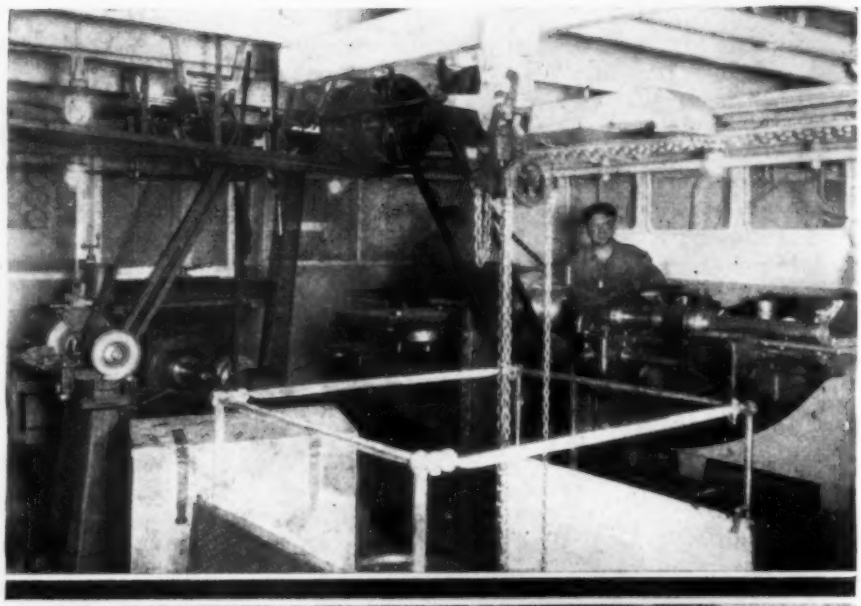


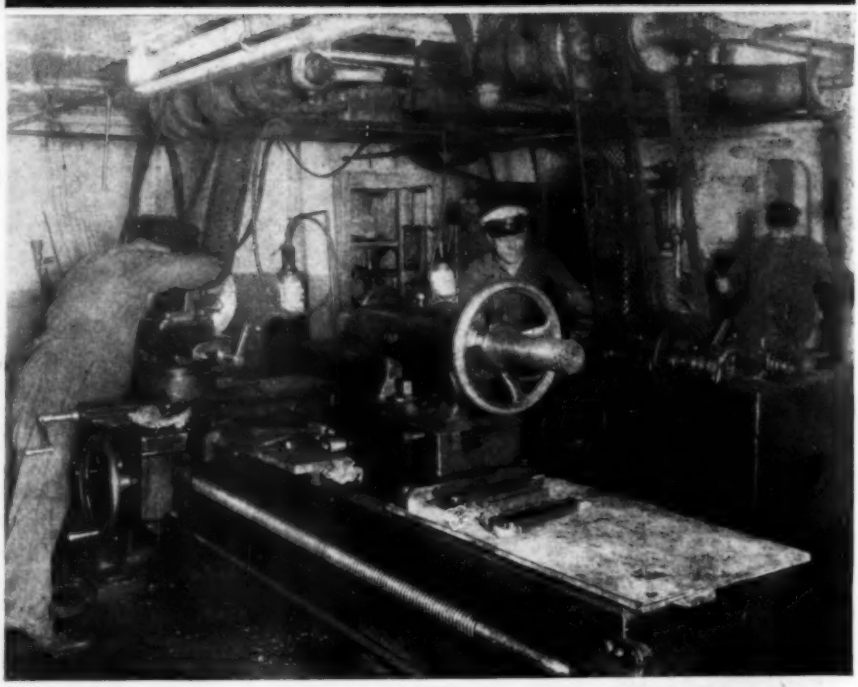
A general view of the shop, looking forward. At the left center is the trapdoor which communicates with the engine room

reveals a layout arranged for maximum effectiveness, considering that its jobs are repair and maintenance work and that space is at a premium.

Work is raised from the engine room by means of the monorail shown in the photographs. Its chain hoist of the worm-gear type can be used also to set up jobs in the larger of the two lathes with which the shop is equipped. Set-ups on the other machines require hand lifting, but since any number of helpers are available and few extra-heavy jobs are encountered, this occasions no difficulty.

EQUIPMENT in the shop includes a combination horizontal milling machine, a 22-in. shaper, a 20-in. permanent-gap lathe, a 14-in. lathe, two single-spindle vertical drills, a double-wheeled grinder, and a grindstone. One of the drill presses, at the right in the general view of the shop, is capable of handling the larger sizes of drills and carries a power feed, the other is a hand-fed, high-speed unit. The tools are of German manufacture, graduated in the metric system, with a single exception—the shaper. That tool, despite its prominently displayed German label, is graduated in inches, bears an English letter series on its ram, and seems to present a decidedly "exported American" appearance. The larger lathe carries a toolholder of the old style, utilizing three setscrews to hold a solid tool. It has an unusually large tailstock screw. The smaller lathe also uses the forged type of tool, no tool-bit holders being in evidence anywhere in the shop. The grindstone, seemingly out of place in the shop, is used by ship engineers to sharpen scrapers and similar tools.





Above—A view of the shop, looking aft, showing the grinder, shaper, miller, and main workbench. The trapdoor is in the foreground

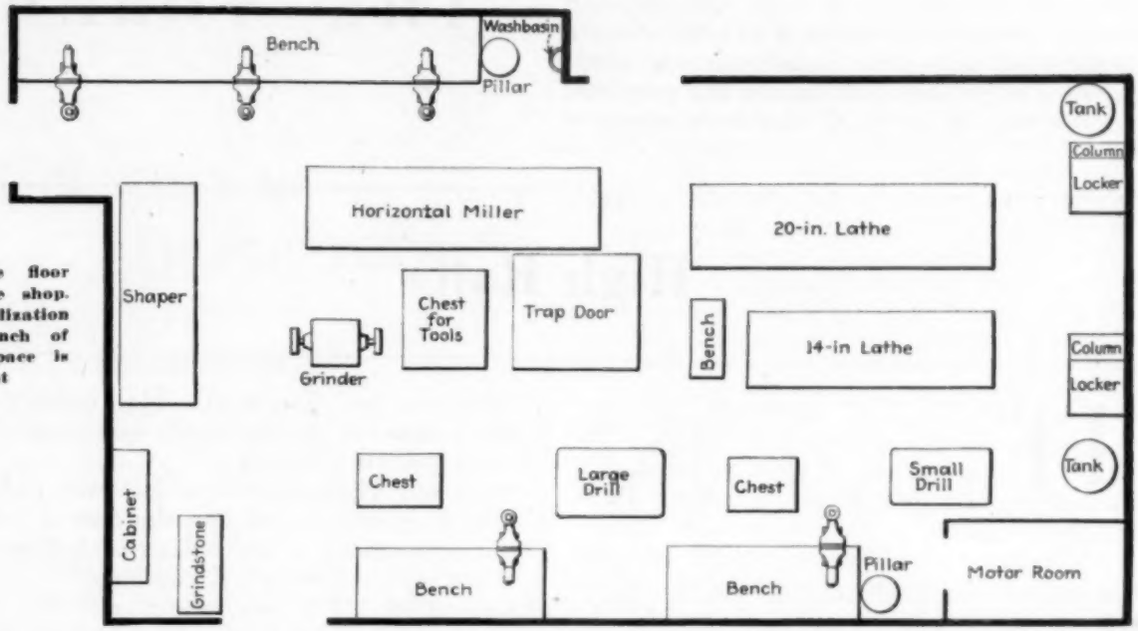
Below—The lathes. Notice the forged tools, large-screw tailstock, set-screw type toolholder, lighting plan, and handy tool lockers

Power for all the machines is supplied from a single line shaft, but careful guarding obviates any danger to workmen from the multitude of belts in the low shop. This guarding is particularly evident around the drill presses where the belts come down to the floor. (There are, incidentally, one or two small vertical drill presses mounted in the boiler rooms to handle the vast number of small drilling jobs which can be done without taking the piece to the shop. "Watch engineers" do most of this drilling.)

Working conditions are of the best. Although the shop is eighteen feet below the water line, lighting is exceptional. In addition to the 200-watt, 220-volt lamps supplying general illumination, extension lamps are mounted at each machine and by the work benches. Floor, walls, ceiling, and benches are of steel plate, but the room is made cheery by white enamel. Workbenches, too, are plentifully supplied with drawers and packing space, all small tools being kept either in these drawers or in the cabinets near the various machines. There are three workbenches in the shop, the two smaller ones carrying a vise apiece, and the larger, three vises, all of the universal type.

Since ventilation is supplied by the general ship system, the temperature of the shop may be controlled within a few degrees. The smoke created by the flashlight that was used in taking the pictures accompanying this article was dissipated in a few moments by increasing the rate of change of the air.

Four machinists comprise the regular working force, three of them general machinists and the fourth a fitter. They are commanded by Second Engineer Pfennig, who of course reports to Chief Engineer Eints. This small group, it must be remembered, is augmented by the engineers as soon as the ship makes port. Men, who



Approximate floor plan of the shop. Effective utilization of every inch of available space is evident

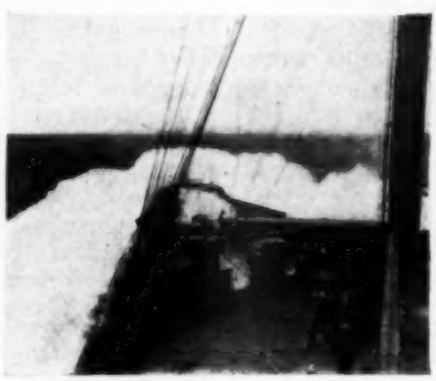
during the voyage stand regular watches in the engine and boiler rooms, thus become machinists, machinist helpers, and millwrights in port. These take care of assembling and dis-assembling, the regular machinists handling the bulk of the shop work.

Shop working hours are from eight to five, with an hour for lunch. The machinists thus work our boasted American eight-hour day, which is something many Americans are not yet doing. Wages, however, are considerably lower than those paid American machinists of equal rank, due in part to Germany's present economic position.

There is, of course, little field for machinists on shipboard, both because of the small forces required on modern liners and because of the availability of watch engineers for all but the most exacting jobs. There are always plenty of helpers available. But a machinist on board a boat is like a doctor on land—if something goes wrong, he must turn out and fix it, whether it be in port or on the high seas, whether at noon or at midnight.

Several workmen professed more than a mere acquaintance with *American Machinist;* one man, the representative of Blohm & Voss, builders of the *Europa,* as well as the *Leviathan* and several of the other large boats now owned by this country, has been a regular contributor to the "Foreman's Round Table."

Work handled by the shop includes piston rings, valve parts, gears for various engines, and a multitude of miscellaneous jobs. During our inspection, for example, an oil ring from one of the boiler room fans was being refaced in the larger lathe, a worm gear from a promenade deck engine was being repaired at the bench, and a new gasket for a cylinder head was being made on the floor.



There is a lesson which might well be learned from this little maintenance shop, a lesson in utilization of available facilities and space. Advocates of the "one tool for one job" idea might be horrified at the methods in vogue in this ship shop. Here the drill press may suddenly become a boring mill, and the miller a horizontal drill. The lathes may act as power saws, and the shaper may cut the teeth and the keyway in a gear blank. Here also, rough castings and other material for repair work are hoarded as carefully as the cutting oil—for there is only a limited quantity available.

ALTHOUGH the shop does a large variety of work, it is distinctly and exclusively a machine shop. Such tasks as repairing piping, fittings, plumbing, electrical fixtures, switchboard equipment, and similar ones are divorced completely. Specialists in each of these fields have their own workrooms in other parts of the ship completely equipped for all work they are called upon to do. This eliminates difficulties occasioned by several different kinds of craftsmen attempting to use the same machines at the same time—difficulties which occur oftener than they should in shops located many miles from the sea.

The machine shop of the *Europa* has a definite task to do, a task which is not confused with a multitude of others which should be taken care of by other agencies. Consequently, no difficulties occur, and no question of duty is raised. There it is, a tiny unit in the vastness of a great liner, but none the less, the "machine shop extraordinary" to the newest "Queen of the Seas."

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions given at the foot of the page have been arranged

High Rates

"HOWDY, Ed! Let's eat," greeted Al as he entered Ed's office. "By the way, what were you and Joe Cook doing so long in Williams' office? Been scrapping again?"

"Not this time. Joe was there for one reason and I for another, but we both got the same dose."

"What was the trouble?"

"Well, you have been talking so much about giving your dependable men an increase —I made up a list and sent it in to Williams."

"I am glad you did, Ed. You have some good men, and I'm glad to see them get a raise."

"So am I. But they didn't get it—at least not yet."

"What's the hitch?"

"Well, Williams said my argument was no good, and my 'outlook,' whatever that is, was wrong."

"Did Joe Cook send in a list too?"

"No. But his 'outlook' was the same as mine, Williams said. It seems Joe has been hiring at the very top rate."

"How many names did you have on the list?"

"About twenty I guess."

"Which one did you leave off?"

"The fact is the men were so nearly equal I didn't really know where to leave off, but when Williams asked me if I thought Mason, the last man on the list, should receive the same rate as Kelly, the first one, I woke up to the fact that maybe I had gone too far."

"What did you say then?"

"I told Williams the men would work better and take more interest if they got a raise."

"What did Williams say to that?"

"Nothing, just then. He turned to Joe Cook and asked him if he had been hiring men at the top rate for the same reason. 'Not exactly,' Joe said. He couldn't get good men for the work any other way."

"Then what?"

"Then Williams asked Joe whether his men were any worse than the ones I had in my department, and the darn fool answered that they were better, if anything. Williams started off. 'Ed, here, wants an increase for nearly his whole force so they will work harder and take more interest. Instead of paying them because they have worked hard and taken interest, he wants to pay them because they haven't done so and he hopes they will. The way he puts it up to me it's a holdup game. If I want them to take an interest and do the amount of work they should, I must pay them in advance. You want a special rate so as to get new men, and then you tell me that your low rate men are as good as Ed's high rate men. Now let me tell you men something—two things.

"'The first is that a good foreman is supposed to, and can, run his department with the men available. He can divide up his work to suit their several capacities. Both of you read up on the 'Law of Transfer of Skill,' and you will see why I don't fire you both and hire all superintendents. The second thing I want to tell you is that the breakfast a man eats, or how late he was up the night before has more to do with his day's output and quality than the rate he is paid. The idea that a raise of pay influences quality or quantity is all rot. A raise of pay is a state of mind, entirely independent of how much a man gets. The desire for a raise is caused by outside dissatisfaction. Granting a raise evokes temporary enthusiasm, but the increased activity is entirely mental, and the man ends up by thinking it was owed him anyway.'"

"I suppose he said a lot more, Al, but that's about all I remember just now."

Is pacifism invading management?
Do we mistake weakness for altruism?

Foremen are invited to discuss these questions vital to their work; of course the

DISCUSSION OF EARLIER TOPICS

Boss or Advisor?

EMERSON'S dictum on teachability is probably adaptable even to the foreman of a machine shop. "Do you know," he asks, "the secret of the true scholar? In every man there is something wherein I may learn of him; and in that I am his pupil." When a man realizes this attitude, every personality has a wholly new value to him. He will attempt, not to dominate and subject every other personality to his own, but will instead find himself drawing out expression from others. When this happens, he will not only broaden and grow, but he will find himself rising in the esteem of others. Anyone appreciates an ear attentive to his own ideas, and is worthy of it if his ideas have a thoughtful basis.

While it is true that many machinists work mechanically, with no particular mental alertness to their task, others have a ready eye for points of improvement. Most workmen, however, hestitate to give expression to such observations because they fear the foreman will object to being told how to "run his business." That is frequently true. However, in the small shop, and where time study methods are not employed, the alert workman generally sees some opportunities for short-cuts and improvements overlooked by the foreman, simply by virtue of his greater familiarity with the job.

As a means of encouraging the expression of such suggestions, we have tried out the method of adding a dollar every pay-day to the check of the employee offering the best suggestion for improvement about the plant. The results have included such things as the making of improved jigs, changing the order of certain operations in the production series, the conservation of certain waste materials, all representing a very substantial saving. Better still, it has proved to the men that the foreman is willing to hear their point of view and is ready to learn, even though his years of experience be many times theirs.

—O. S. WALTERS, *Manager, Garber Tool Company.*

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New Drills and Old Men

THE Bill Jacksons of machine shops are the ones who help to relieve the monotony of so-called 'bossing.' The drills were requisitioned by Al after he had been convinced of their superior productive capacity, and he is the type of man who neither wants to lose good men, nor to have his purchases criticised.

The answer is obvious. On arrival and installation of the machine it is set up on a job previously done on the older type machine. The service man from the supplier, a disinterested operator or demonstrator, or even Al himself gives it a trial run and the operation is officially timed by the rate-fixer. Rest assured Bill Jackson is not uninformed of what is going on.

The piece-work prices are set and care must be exercised in proving to Bill just what the machine is costing the firm per hour, whether running or not. Some inducement must be subtly offered, either in easier manipulation or quicker operations.

He is then offered the machine at the new rates with his earnings guaranteed for a one week's learning run. If he refuses to take the offer, which is unlikely, he must be given one week's notice to quit and this must be final.

The decision must be unalterable; one must suffer for the sake of the many. Al will probably be purchasing more machines and he must not be rendered impotent each time a machine is installed.

—D. MILLINGTON, *Huddersfield, England.*

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Compulsory Membership in the Mutual Aid

IT IS perhaps unknown to American readers that, in Austria, membership in a sick benefit association is compulsory for executives as well as workers. We had sick benefits before the War, but membership was voluntary, and in most cases they were used only by people with small incomes.

Changes in the social order, and the comparatively insufficient salaries of executives, brought about compulsory membership. It is, however, not popular, although the opposition is largely mental, brought about by the fact that it tends to limit one's action as an individual. Personally I believe such associations are a great help in times of economic upheaval, and as their efficiency depends upon the number of members, membership should be compulsory.

—FRANZ BERMAN, *Consulting Engineer, Vienna, Austria.*

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Smoking During Working Hours

THE question of special privilege for office workers is probably as old as industry itself, and the reasons for such privileges are not and never have been clear. The shop man can only comfort himself with the thought that, generally speaking, the rank and file in the shop receive more pay, if fewer privileges, than those in the office.

The granting of smoking periods is, I believe, a very poor solution. In my experience, covering a good many years, I have seen many special privileges granted, such as time allowed for washing up, time allowed prior to pay line, time allowed to put pneumatic tools in toolcrib where there was danger of freezing overnight. In fully 90 per cent of these cases the privilege was so abused that in the end it had to be revoked.

If the fire hazard is not too great, smoking should be permitted on the shop floor by all. Many shops permit smoking in one department, as, for example, the foundry, and forbid it in another where the hazard is greater,

discussion is not limited to foremen. Letters accepted and published will be paid for

such as in the pattern shop. In such cases the workmen are sensible enough to appreciate the reason for the distinction and do not resent it.

Most workmen do not envy the supervisor any privilege he may have. They consider it due his position. They do resent privileges granted to or assumed by others of equal or subordinate positions. If smoking cannot be permitted on the shop floor by the workmen, it should not be done by either the supervisors or visitors and it's up to the supervisors to see that it is not done.

—EDWARD SEARLES, *Master Mechanic, Naval Aircraft Factory, Philadelphia.*

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Too Much Co-Operation

IT IS quite evident that Williams, or Ed, or both, are very poor executives. Somewhere there's a "nigger" in the wood pile, for it should not have been possible for Ed's new assistant to have found the system so decrepit that, in his efforts to straighten it out, he and the department fell such unfortunate victims.

If Ed had co-operated properly with his assistant he would not have had reason to bawl him out, especially so that it was overheard.

I believe any foreman should personally control his shop policies, in so far as the company has not laid them out, for herein is an important factor contributing to his success, and if he is honest, enthusiastic and knows his job, he will, automatically, so co-operate that his assistant and associates, almost without exception, will be with him, and he will be giving advice, not reprimands.

—JACK SARGENT, *Foreman, R. Wallace & Sons Manufacturing Company.*

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When Personal Tools Are Damaged

A TOOLMAKER, diemaker, or patternmaker usually purchases for his own use those tools and indicating and measuring instruments for which he finds frequent use in his regular line of work. He does this because his rate of pay permits it and because he finds it more convenient to use his own. These tools, being his own, are likely to be well kept. Whether they are or not, they in time become almost a part of the man himself, reflecting in their care and appearance the character of the owner. Should these personal tools become damaged or broken, or even wear out in service, the owner should replace them himself, as they are part of his means of earning a living.

In some large plants the management furnishes all the equipment of the toolmakers, diemakers, and patternmakers, no individual owner's tools being permitted on the premises. These employers have set a standard for the equipment to be used by these men, and by so doing they are in better position to standardize the output of the department and to judge the men by their use of the tools rather than by the tools they use. The use of this same method would pay even the shop employing only one man to take care of this work. The quality and quantity of the work turned out would not then be dependent upon the varying contents of the tool kits owned by the different men employed at various times.

—C. H. LATTNER.

Off With the Old, On With the New

GOOD operators of machine tools take such pride in their machines that they have been known to quit their jobs when the condition of a machine did not allow them to be proud of it. Many a good man has found his work irksome, and has become disgruntled and dissatisfied, because he has had to operate a machine which he could not admire.

The appearance of the shop and equipment influences applicants differently. Generally, the higher the quality of a man the greater is the influence of these things upon him. A dirty, dingy, disorderly shop will depress and disgust the sensibilities of the high-grade man accustomed to cleanliness, brightness, and order. Such a shop seems to say, "Abandon hope all ye that enter here."

A clean, bright, orderly appearance has just the opposite effect on a good man. It attracts, inspires, and expands his spirit. It invites and commands his loyalty. He feels that he belongs to it, and it to him. Consequently he anticipates that his service will be wholehearted, undepressed, undiminished by a wasteful environment, and if he fails to report after being hired, some other of the manifold things that intervene will have been the cause.

—J. J. WOFFINGTON, *Warwickshire, England.*

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Old Kinks and New Ideas

MOST good kinks and new ideas find their way into the technical magazines or into the transactions of the engineering societies at which they are presented. This form, then, presents the logical method of preservation.

Most organizations have installed the system of circulating such magazines to the foreman through the local mail distribution system. It should require no effort for a foreman to initial a kink or new idea that applies to the work in his shop at the time he reads it.

When the magazine has completed its rounds, and would normally be destroyed it should be turned over to the messenger boy. In his spare time, he can cut out all initialed items, mount them uniformly, sort them as to foremen, and deliver them in small lots after they have accumulated.

The foreman, previously supplied with a box in which the uniform mountings fit freely, can then roughly index the item as he would think of it, and file it accordingly. Having the foreman index his own file is important, as usually no two people see the same item in the same light, and the general heading of a magazine article is often best reduced to the specific application it would have in a particular shop.

—EARL FAIRALL.

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The Ethics of Making a Change

A CHANGE in position for a supervisor requires a lot of cool, calm, hard thinking.

In the final analysis the great majority of men do not seek money for its own sake, but for what it may bring in happiness and contentment. Ed should determine whether his present ill humor is caused by conditions that

cannot be changed or whether it is due to causes that will be forgotten in the next six months.

Satisfaction, or as stated above, contentment, is the prime consideration in any position. The unhappiest man and the most unprofitable employee is the man who accepted a position he doesn't like because it paid a little more money than one in which he was perfectly contented. —Ed. Searles, *Master Mechanic, Naval Aircraft Factory, Philadelphia.*

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Eating During Working Hours

THE wording of a rule determines its scope, and if there are to be exceptions allowed to the rule they should be as clearly stated as the rule itself.

If the rule reads, "No eating during working hours," every violation of that rule is an infraction of it regardless of the position of the party who eats during working hours. The infraction may be overlooked, but that does not make it an exception to the rule.

Should the rule read, "No eating during working hours except at 10 o'clock, when a sandwich, an apple, or the equivalent may be eaten," the exception is clearly stated, and yet the rule is broad enough to cover the prohibition against emptying the lunch box before the dinner hour.

About the only satisfactory way this matter can be handled is to be governed by the general practice prevalent throughout the district within which the plant is located, or by the established custom of the plant itself. These are the yardsticks by which the employees measure their conduct. —Chas. H. Richards, *Patent Attorney.*

ED'S case is typical of a hasty action likely to cause a grievance out of all proportion to its importance. No rule apparently exists regarding eating during working hours, and laxity has created a breach of the unwritten law. The growth of the habit points to a need for restriction. Limit the "al fresco" luncheon to a defined ten minutes, specify the limitations, and demand its observance.

Backing down should not be necessary in this case, for a less nauseous remedy is available. But, should Ed find his own fair judgment demands such a sacrifice to his dignity, let him do it, and be a better man for the experience. —James G. Turton, *Engineer, Heald Machine Company.*

SO MANY conflicting reasons for and against make it extremely difficult to know where discipline ends and duty begins. From the hygienic standpoint, it is bad practice to eat with dirty hands. Yet we find men, day in and day out, gradually ruining their health through this practice.

Foremen, by virtue of their position, are granted certain privileges, and it is a poor argument to assume that because a foreman can do a certain thing, every Tom, Dick, and Harry can do the same.

From observation (and it may seem strange) I find the number of eaters invariably corresponds to the number of young men employed. Older men touch little or nothing between meals. If we add to these the "no breakfast brigade," or late comers, the percentage is not very great in the average shop. The only effective weapon to use against this particular form of time waste is tact.

The suggestion of a quarter of an hour respite means either longer working hours or increased charges. But in avoiding these uneconomic alternatives we prevent an injustice to the "non-eaters" and save hours in starting-up. —W. Lestye, *Manchester, England.*

*

Smoking During Working Hours

SMOKING, like drinking and drug taking, becomes a habit which, once it gets hold, is very difficult to stop. Men will take all manner of risks to have a "draw" during working hours.

Many attempts have been made to stop the habit. Men who were caught have been dismissed. But I do not know of any works where it can be said that smoking is not done. I know many where it is not allowed. "Strictly Forbidden" notices being posted in all places where struck matches tell their tale.

In many cases the habit of smoking during working hours is a relic of the time when the owner worked on with the men. I know several of these shops today, where the men are allowed to smoke all day if they like, and very nice shops they are to work in. Some time back I visited a large works in Yorkshire. While going through the shops, I saw most of the men light their pipes, I found out that this was allowed between 10 and 10:30 in the morning and 3 and 3:30 in after noon. The manager informed me that after one month, to get the men used to the new idea, he posted a notice that smoking outside the time allowed would mean instant dismissal, and though he personally kept watch, he had never found any man smoking outside this hour. It proved such a success that other firms in the district have since adopted the plan.

—S. Forman, *Notts, England.*

THE question of allowing men to smoke at work presents many problems. If you allow 30 minutes during the morning, between 10:30 and 11, and 30 minutes during the afternon, from 4 to 4:30, you find lots of men who do not want a smoke at that particular time. These, therefore, go off and waste time smoking when they feel they must have a draw. To avoid waste of time like this, the only logical thing to do is to allow smoking at any time during the day, which means men are passing cigarettes around and handing each other lights at all times. In my view this tends to slacken discipline, and makes it much harder for the foreman to control his shop.

Would it not be better to prohibit smoking altogether during working hours. I feel sure most smoking is simply force of habit, not really necessary or enjoyed. No smoking would be better for the men, and would tend to keep everyone more efficient.

—Frederick W. Kelly.

* * * *

THE · NEXT · TOPIC

"Vacations Again"

Selective Inspection Cuts Assembly Costs

By WALTER G. HOLMES

The method of gaging and assembling disclosed in this article was developed and is at present used successfully in one of the country's largest automobile plants. Its use has resulted in a considerable saving in assembly labor. The object of this method is the maintenance of accurate fits without the necessity of excessively close machining tolerances.

ACCURATE fits have ever been the goal of machine shop practice. From the days of eighth and quarter inch measurements to our own era of split thousandths, there has been a progressive improvement in the preparation of mating parts for a predetermined clearance or drive.

The advent of automotive practice created a demand for accurate assembly tolerances combined with low manufacturing costs. Even with improved accuracy of machining, subsequent operations were often found necessary to keep within the desired limits of fit. Hand fitting gave way to selective assembly and the use of shimmed bearings. Today many plants consider it more efficient to employ some means of adjustment in assembly rather than to attempt to hold machining operations to the very close limits their tolerances of fit would demand.

The objection to both selective assembly and shim adjustments has been the cost. Bearings had to be assembled, checked for error, reassembled, and rechecked. The gaging method herein described is designed to overcome this objection; it retains the desirable features of either shimmed or selected bearings but eliminates the process of trial and error. While essentially a development of automotive manufacture, this system is based on fundamental principles adaptable to any industry where bearings are fitted in large quantities.

Group classification of shafts and bearings during inspection with convenient means for their identification is the keynote of this method. Since these parts must be

Table I

Bearing Sizes		Spherical Gage Sizes for Bores of Bearings		Name of Group	Color of Group
.....	3.2485	.....	3.2485	Undersize	Special red mark
3.2486	3.249	3.2485	3.249	3rd low	2 red marks
3.2491	3.2495	3.249	3.2495	2nd low	1 red mark
3.2496	3.250	3.2495	3.250	Low	Yellow
3.2501	3.2505	3.250	3.2505	Medium	White
3.2506	3.251	3.2505	3.251	High	Green
3.2511	3.2515	3.251	3.2515	2nd high	1 blue mark
3.2516	3.252	3.2515	3.252	3rd high	2 blue marks
3.2521	.....	3.252	.....	Oversize	Special blue mark

Table II

Shafts Sizes		Snap Gage Sizes for Outside Dia. of Shafts		Name of Group	Color of Group
.....	3.2464	.....	3.2465	Undersize	Special red mark
3.2465	3.247	3.2465	3.2471	3rd low	2 red marks
3.2471	3.2475	3.2471	3.2476	2nd low	1 red mark
3.2476	3.248	3.2476	3.2481	Low	Yellow
3.2481	3.2485	3.2481	3.2486	Medium	White
3.2486	3.249	3.2486	3.2491	High	Green
3.2491	3.2495	3.2491	3.2496	2nd high	1 blue mark
3.2496	3.250	3.2496	3.2501	3rd high	2 blue marks
3.2501	.....	3.2501	.....	Oversize	Special blue mark

Table III

					Name of Group	Color of Group
Bearing Dia.	3.2486	3.2486	3.249	3.249	2nd low	2 red marks
Shaft Dia.	3.2465	3.247	3.2465	3.247	2nd low	2 red marks
Clearance	.0021	.0016	.0025	.002		
Bearing Dia.	3.2491	3.2491	3.2495	3.2495	1st low	1 red mark
Shaft Dia.	3.2471	3.2475	3.2471	3.2475	1st low	1 red mark
Difference	.0020	.0016	.0024	.0020		
Bearing Dia.	3.2496	3.2496	3.250	3.250	Low	Yellow
Shaft Dia.	3.2476	3.248	3.2476	3.248	Low	Yellow
Difference	.0020	.0016	.0024	.002		
Bearing Dia.	3.2501	3.2501	3.2505	3.2505	Medium	White
Shaft Dia.	3.2481	3.2485	3.2481	3.2485	Medium	White
Difference	.0020	.0016	.0024	.0020		
Bearing Dia.	3.2506	3.2506	3.251	3.251	High	Green
Shaft Dia.	3.2486	3.249	3.2486	3.249	High	Green
Difference	.0020	.0016	.0024	.002		
Bearing Dia.	3.2511	3.2511	3.2515	3.2515	1st high	1 blue mark
Shaft Dia.	3.2491	3.2495	3.2491	3.2495	1st high	1 blue mark
Difference	.0020	.0016	.0024	.0020		
Bearing Dia.	3.2516	3.2516	3.252	3.252	2nd high	2 blue marks
Shaft Dia.	3.2496	3.250	3.2496	3.250	2nd high	2 blue marks
Difference	.0020	.0016	.0024	.002		

are measured by spherical end gages with means of telescope adjustment. Handles are provided at right angles to the body of the gage for convenience in their use. One of these gages is first set for the medium group, that is, the one intermediate between the extreme limits of tolerance. This is done by means of a micrometer or snap gage which has been carefully set with precision gage blocks. The other gages are set from a dial comparator which has been adjusted to the first gage for its zero reading. Continuity of standard is maintained by the use of a lapped ring gage fitting the medium-sized spherical gage. Each of these gages determines the limit between two bearing groups and serves as a "go" gage for the larger group and a "no go" gage for the smaller group.

Spherical gages for bearing bores are set 0.0001 in. smaller than the actual bearing diameter. Since it takes a slight drive to enter a one inch plug into a one inch hole, this 0.0001 allowance produces a normal gaging field. In the same way in the inspected in any case, the only additional cost is that of marking them according to their group. The gaging methods here set forth keep this cost to a minimum and pay for themselves many times over in the simplification of assembly operations. Parts forming the bearing may be assembled with the assurance that the desired tolerance will be maintained.

The selection of shaft and bearing groups is made by dividing the total tolerance between the high and low limits into equal steps. The range of each division is chosen arbitrarily; a value of 0.0005 in. has been found to work out very conveniently. Too narrow a range makes classification more difficult; too large a range results in a greater variation in fits than can be corrected by shim removal. A distinguishing name, number, or color is assigned to each group.

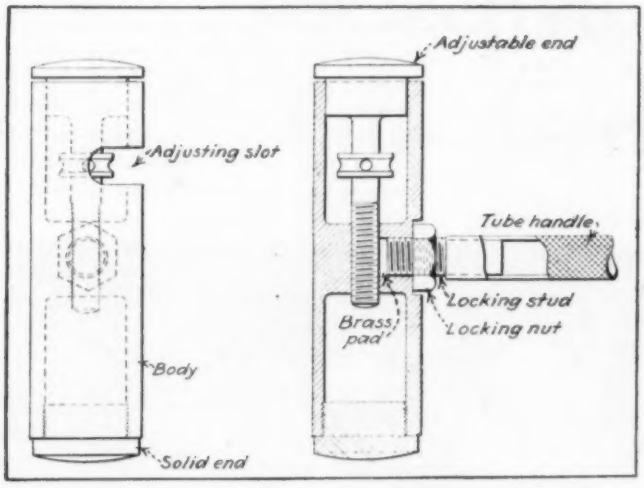
In the actual selective inspection of bearings the bores

Table IV

Bearing Sizes		Spherical Gage Sizes Bores of Bearings Go	No Go	Name of Group	Pull Shims
.....	3.2519	.....	3.2519	Undersize	..
3.252	3.2524	3.2519	3.2524	2nd low	0
3.2525	3.2529	3.2524	3.2529	Low	1
3.253	3.2534	3.2529	3.2534	Medium	1
3.2535	3.2540	3.2534	3.2540	High	2
3.2541	3.2545	3.254	3.2545	2nd low	3
3.2546	.....	3.2545	.....	Oversize	..

Table V

					Name o Group
Bearing size	3.252	3.252	3.2524	3.2524	2nd low
Shaft size	3.2500	3.2505	3.2500	3.2505	
Clearance	.002	.0015	.0024	.0019	
Bearing size	3.2525	3.2525	3.2529	3.2529	Low
Shaft size	3.2500	3.2505	3.2500	3.2505	
Difference	.0025	.002	.0029	.0024	
Remove 1 shim	.0007	.0007	.0007	.0007	
Clearance	.0018	.0013	.0022	.0017	
Bearing size	3.253	3.253	3.2534	3.2534	Medium
Shaft size	3.2500	3.2505	3.2500	3.2505	
Difference	.003	.0025	.0034	.0029	
Remove 1 shim	.0007	.0007	.0007	.0007	
Clearance	.0023	.0018	.0027	.0022	
Bearing size	3.2535	3.2535	3.254	3.254	High
Shaft size	3.2500	3.2505	3.2500	3.2505	
Difference	.0035	.0030	.004	.0035	
Remove 2 shims	.0015	.0015	.0015	.0015	
Clearance	.002	.0015	.0025	.002	
Bearing size	3.2541	3.2541	3.2545	3.2545	2nd high
Shaft size	3.2500	3.2505	3.2500	3.2505	
Difference	.0041	.0036	.0045	.004	
Remove 3 shims	.0022	.0022	.0022	.0022	
Clearance	.0019	.0014	.0023	.0018	



For measuring bearing bores, a series of telescopic end gages is used. The spherical contact parts are initially set from precision gage blocks

measurement of shafts, the snap gages are set 0.0001 in. larger than the outside diameter required.

Small shafts are gaged by a dial comparator set from standard gage blocks. Larger sizes are measured with special snap gages with as many gaging pins as there are groups into which the shafts are to be divided. These pins are the dividing points between the dimension groups, and this arrangement greatly facilitates the classification of shafts.

Group distinguishing colors are painted on the shanks of spherical gages and on the webs of snap gages. Quick drying paint is used to mark the shafts and bearings to identify their grouping after inspection.

Where shims are used they are 0.0015 in. thick. Thus the removal of two shims, one from each side of the bearing will reduce the bore 0.0015 in. If only one shim is removed the bearing becomes smaller by half this amount or about 0.007 in. The removal of three shims, two from one side and one from the other reduces the bore by 0.0022 in. Four shims removed make the bearing 0.003 in. smaller.

THE fitting of bearings and shafts may be divided into four general classes:

(a) Solid bearings using no shims; the shaft and bearing are machined to manufacturing limits and fitted by selective assembly.

(b) Where the shaft is machined within close limits (say 0.0005 in.) but the bearing is allowed a wider commercial tolerance. Fits are obtained by shimmed bearings.

(c) Where the bearing is machined within close limits (say 0.0005 in.) but the shaft is allowed wider variation. Shim removal is used to obtain fits in this class also.

(d) Where neither shaft nor bearing are held to very close limits but are fitted by the use of shims.

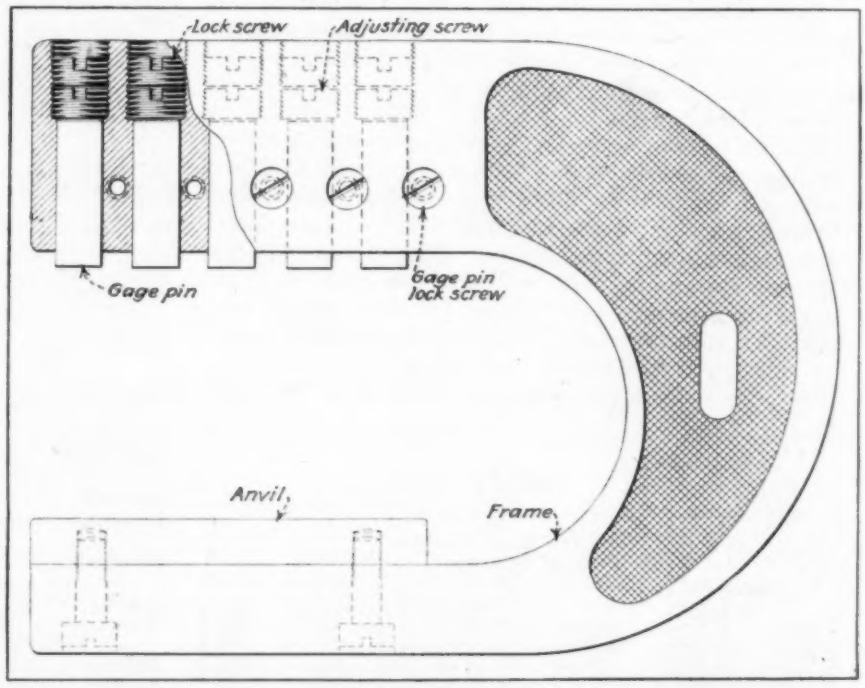
The practical application of the method of gaging and grouping bearings in each of the above classes will now be shown in detail. It should be remembered that the definite dimensions and tolerances given are merely examples to illustrate a general method having a wide range of possibilities.

Assume a bearing inside diameter salvage limit of 3.2486—3.252 in. and a nominal desired working limit of 3.249—3.251 in. Bearing groups are then tabulated in Table I in steps of 0.0005 within these limits. From these groups the gage sizes are readily ascertained and listed in the second column. Distinguishing names and colors are then given each group and placed in columns three and four.

Assuming a shaft salvage limit of 3.2465—3.250 in., a nominal desired working limit of 3.2465—3.2485 in., and a clearance tolerance of 0.0015—0.0025 in., groups for the shafts are set up in a similar manner. The outside diameter groups are determined in steps of 0.0005 in. and listed in the first column of Table II. Then gage sizes are tabulated. For shafts too large to measure in a dial comparator, special snap gages are set.

Table VI

Bearing Size		Spherical Gage Sizes for Bores of Bearings Go	No Go	Name of Group	Color of Group
.....	3.2499	.....	3.2499	Undersize	.....
3.2500	3.2503	3.2499	3.2503	2nd low	Red
3.2504	3.2508	3.2503	3.2508	Low	Yellow
3.2509	3.2513	3.2501	3.2513	Medium	White
3.2514	3.2518	3.2513	3.2518	High	Green
3.2519	.....	3.2518	.....	Oversize	.....



A special multi-pin snap gage facilitates the classification of the larger shafts according to diameter. Smaller shafts are readily gaged in a dial comparator

Where salvage sizes are seldom used, they may be determined by micrometer, and only nominal desired working limits covered by the step snap gage. It should be remembered that contact pins in the gage should be set up 0.0001 in. larger than the equivalent shaft size. The 3.2464 undersized shaft will be found by the 3.2465 gage passing over it—the 3.2501 oversized shaft will be found by the 3.2501 gage not passing over it. The medium outside diameter of the shaft is smaller than the medium bore of the bearing by the amount of the mean clearance tolerance, 0.002 in. Thus the medium bearing sizes 3.2501—3.2505 establish 3.2481—3.2485 as the medium shaft range. The third and fourth columns of Table II are filled in to correspond with the names and colors of the bearing group in Table I.

IT is obvious that from the method used in determining sizes of shafts in Table II, that shafts must be used only with bearings in the corresponding group. Table III shows the greatest and least clearances possible in each group by comparing the limiting combinations of shafts and bearings. An inspection of this table will show that all clearances fall within the set limits (0.0015—0.0025 in.) Hence any shaft when assembled with a bearing having the same identification color will have the desired clearance.

In Class (b) a shaft tolerance of 0.0005 in. is assumed. On certain classes of work, this degree of accuracy may be obtained without excessive cost. Centerless grinding has been used to good effect for this purpose. A shaft 3.2500—3.2505 in. will be taken as an example. As in Class (a) a clearance limit of 0.0015—0.0025 will be used. Then the highest shaft size must be 0.0015 in. smaller than the lowest bearing size fixing the latter at 3.2505 plus 0.0015 in. which equals 3.252. Assuming a manufacturing limit in the bearing bore of 0.0025 in., the maximum bearing size will be 3.2545 in.

Table VII

Shaft Size		Snap Gage Sizes of Outside Diameter of Shaft		Name of Group	Color of Group
		No Go	Go		
.....	3.2461	.....	3.2462	Undersize	.....
3.2461	3.2465	3.2461	3.2466	2nd low	Red
3.2466	3.2470	3.2466	3.2471	Low	Yellow
3.2471	3.2475	3.2471	3.2476	Medium	White
3.2476	3.2480	3.2476	3.2481	High	Green
3.2481	3.2485	3.2481	3.2486	2nd high	Blue
3.2485	.....	3.2485	.....	Oversize	.....

Table IV is set up by the method described for Table I. The first column gives the steps in bearing bores, the second gage settings, and the third the group name. The number of shims to be removed is determined as shown in Table V and summarized in the fourth column of Table IV. The limiting shaft sizes are deducted from the limiting bearing sizes for each group to obtain the gross clearance. Where the clearances are in excess of the tolerance, shim thicknesses are deducted as required.

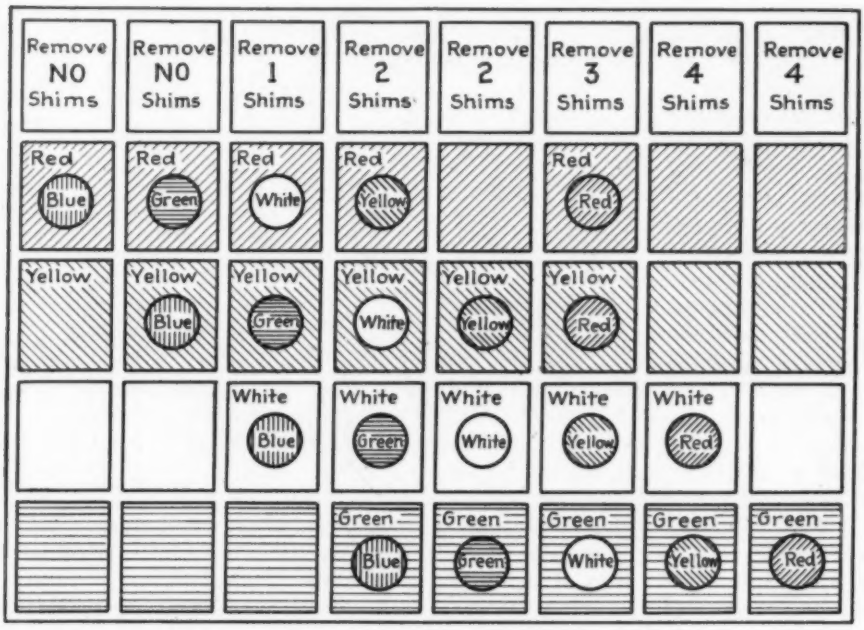
In some cases the shim removal will not give results strictly within the clearance tolerance. For instance in the lower group, the largest bearing and the smallest shaft produce a clearance of 0.0029 in. or 0.004 in. over the high limit. To correct this, one shim is removed reducing the clearance by 0.007 in. This in turn reduces the clearance between the largest shaft and smallest bearing to 0.0013 in. which is 0.002 in. below the low limit. Since this is a combination of extreme sizes, and the variation is less than where no shim is removed, this condition is accepted. In the same way, a deviation of 0.001 in. below the low clearance limit appears in the second high group which is permitted to pass for the same reasons.

THE gages for this class are marked 0, 1, 2, or 3 according to the number of shims to be pulled as shown in Table IV. These marks are transferred to the bearing when inspected. When the operator assembles the bearings, he merely notes these marks—on those marked 0, he removes no shims, on those marked 1, he removes one shim, and so on. This method is maintained without any further check. No record is used other than the transferring of the number on the spherical gage to the bearing frame. Neither the inspectors gaging nor the operators assembling need know more about the method than to follow the numbers on gages and bearings.

Conditions in Class (c) are similar to those in Class (b) except that the bearings are held within close limits (say 0.0005), and the shafts classified according to groups. Assuming a bearing size of 3.2500—3.2505 in. and a clearance tolerance of 0.0015—0.0025 in. as before,

Table VIII

White bearing bore	3.2509	3.2509	3.2513	3.2513
Red shaft diameter	3.2461	3.2465	3.2461	3.2465
Difference	.0048	.0044	.0052	.0048
Remove 4 shims	.0030	.0030	.0030	.0030
Clearance	.0018	.0014	.0022	.0018
White bearing bore	3.2509	3.2509	3.2513	3.2513
Yellow shaft diameter	3.2466	3.2470	3.2466	3.2470
Difference	.0043	.0039	.0047	.0043
Remove 3 shims	.0022	.0022	.0022	.0022
Clearance	.0021	.0017	.0025	.0021
White bearing bore	3.2509	3.2509	3.2513	3.2513
White shaft diameter	3.2471	3.2475	3.2471	3.2475
Difference	.0038	.0034	.0042	.0038
Remove 2 shims	.0015	.0015	.0015	.0015
Clearance	.0023	.0019	.0027	.0023
White bearing bore	3.2509	3.2509	3.2513	3.2513
Green shaft diameter	3.2476	3.2480	3.2476	3.2480
Difference	.0033	.0029	.0037	.0015
Remove 2 shims	.0015	.0015	.0015	.0015
Clearance	.0018	.0014	.0022	.0018
White bearing bore	3.2509	3.2509	3.2513	3.2513
Blue shaft diameter	3.2481	3.2485	3.2481	3.2485
Difference	.0028	.0024	.0032	.0028
Remove 1 shim	.0007	.0007	.0007	.0007
Clearance	.0021	.0017	.0025	.0021



Squares represent the bearings and circles the shafts. This chart uses color combinations to tell the operator just what shim removal will produce the correct fit

the largest permissible shaft diameter will be 3.2500 minus 0.0015 in. which is 3.2485. Given a manufacturing limit of 0.0025 in. on the shaft, the smallest allowable diameter will be 3.246 in. From this data, the dimension groups and gage settings may be set up as in Table II. Another table, similar to Table V is prepared to determine clearances and necessary shim adjustments. Snap gages are marked for the number of shims to be removed or with distinguishing colors which are transferred to the shafts to guide the operator in assembly.

In Class (d) both shaft and bearing have fairly liberal manufacturing tolerances. Retaining the clearance limits of 0.0015—0.0025 in., it is further assumed that the shaft tolerance is 3.2461—3.2485 in. and the bearing tolerance is 3.2400—3.2518 in. This gives a range of 0.0025 in. for the shaft and 0.0019 in. for the bearing. Table VI is then set up similar to Table I and Table VII similar to Table II.

TO keep within the manufacturing limits given will result in four groups for the bearings and five groups for the shafts. A comparison of all possible assemblies of shafts and bearings will indicate the amount of clearance in each limiting combination and the number of shims to be removed to keep this clearance within the set limits. Since these combinations are somewhat numerous, a complete tabulation will not be made but will be exemplified by Table VIII.

In order to cover the complete range of combinations, three additional tables similar to this table are required. It may be readily seen that the use of these tables in the assembly floor would not be convenient. Marking the shafts and bearings alone is not sufficient as it does not take into account the various possible conditions when both shafts and bearings are divided into groups. To overcome this difficulty the chart illustrated was prepared. Here are shown a serious of colored squares representing bearings in which are placed colored circles representing shafts. The squares and circles are so grouped that each vertical column represents a certain shim adjustment.

A large sized wall chart similar to that shown is located in the assembly department where it may be readily seen. As the operator assembles the shafts and bearings, he can instantly determine from the color combinations on the parts he is fitting just how many shims should be removed. The assembly when completed has the proper clearance and needs no subsequent check or adjustment.

On first thought, this entire method may seem involved. It does indeed take time and thought to work up the proper tolerance groups to obtain the desired conditions. All complication, however, is confined to the planning, the actual operation being extremely simple. This is one of the merits of the system; it puts the burden of computing and determining certain elements in advance on the planning department. The shop is freed from these considerations and handles only the mechanical functions of gaging and assembling to distinguishing colors.

Kinks for the Drillers

By J. T. Towlson
Silvertown, London, England

DRILLERS are not classed as mechanics, but their work is at times highly important. The foreman does not always give the drillers the attention that he should. Usually they are left to their own devices as to clamping and setting up.

A driller has many troubles, ranging from drills with the size illegible, to spongy castings that must be drilled straight, and if he is a real driller he finds some way around the difficulty. In most shops the drill-size problem is a serious one, especially on straight shank drills where the chuck jaws have obliterated the size marks. When the drills are returned to the toolcrib for regrinding, the boys are not always careful in distributing them, and much bad work has resulted. The only sure way is for the driller to use a micrometer on each drill.

When it comes to drilling spongy castings, the easiest way is to clamp a piece of flat steel bar over the spot to be drilled, lay out the hole upon it and drill through the bar and into the casting. If a casting is to be tapped, it will help considerably to leave the bar in place and tap through it.

IDEAS FROM PRACTICAL MEN

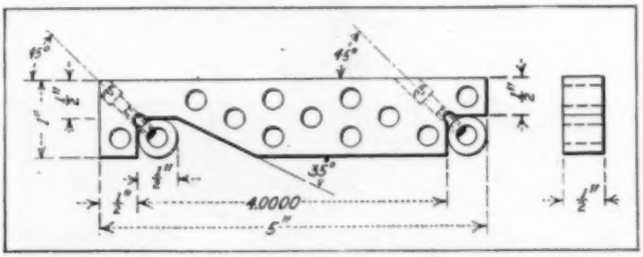
The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit.

Making and Using a Sine-Bar

By Ralph M. Gamble

Machine Designer, Jones & Lamson Machine Company

OCCASIONALLY one sees reference to the sine-bar in the columns of the *American Machinist*, but do all the readers know the value of this really important tool? The sine-bar must be understood before it can in any way be appreciated, and probably, if all tool-



A 4-in. sine-bar

makers were aware that its use reduces the reproduction of angles from guesswork to actual figures in thousandths of an inch, they would rely on its extreme accuracy, rather than on the protractor. In other words, the sine-bar is to the protractor what the micrometer is to the scale.

I know of some well-known shops that do not use the sine-bar, so I have prepared the following directions for making and using it:

There are many kinds of sine-bars in use, but I doubt if there is one of any design that will be of as much delight to its owner as the one shown in the illustration. The body of the tool should be made from machine steel, pack hardened, and ground. The holes make it lighter, furnish a number of places for attaching-bolts, and give more hardening surface. The buttons should be made from tool steel, hardened and ground, and located on the bar as shown. There is little danger of spoiling the bar in the course of making. If too much stock is ground, or lapped, from one locating surface, the error can be corrected by taking more stock off of the other one. This point is invaluable to beginners, as well as to others, who desire accuracy to the highest degree. Should the bar change after it has been used for a while, the error can easily be checked and corrected. While the buttons need not be made to any particular size, the only necessary requirement is that they be of the same diameter.

If, for example, it is desired to grind a piece of work to an angle of 30 deg., look at the table of sines and find the sine of 30 deg. If the sine-bar is four inches between the centers of the buttons, the sine of 30 deg. (0.500) must be multiplied by four to find out how much one end of the bar must be blocked up to be at an angle of 30 deg. Set a planer gage to this dimension, or use a 2-in. gage block and put it on a surface plate. Place the button at the hooked end of the bar on top of the gage, letting the button at the other end rest on the surface plate. The bar will then be at an angle of 30 deg. In this position, the bar should be clamped against an angle plate. The work should then be placed on top of the bar and also be clamped against the angle plate. It will then be at the same angle as that of the bar. The bar can now be removed. The angle plate, with the work attached, can be transferred to the grinding machine with the assurance that the angle ground will be accurately 30 deg. In clamping both the bar and the work to the angle plate, care must be exercised not to disturb the angular position of either.

When not in use, the sine-bar should be laid on its side in the drawer of the tool box, being careful to wipe it thoroughly with a greasy rag or piece of waste. This precaution may seem a bit unnecessary to the unsophisticated, but there are many of us to whom the effect on tools of uric acid in our systems, is well known.

Constant-center Vee Blocks

By H. Moore

Hamilton, Ontario, Canada

Having frequent occasion to center shafts, and tiring of setting the surface gage to different heights for each size, I cast about for a better method. The result is shown in illustration Fig. 1. The two end pieces of the

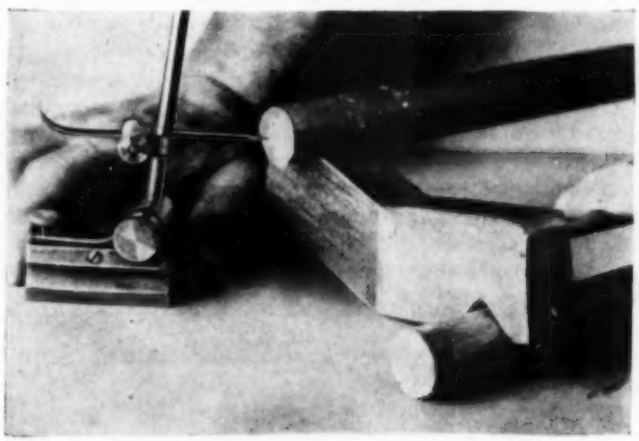


Fig. 1—Centering different sizes of shafts with one setting of the surface gage

fixture are shaped something like a boomerang, and are joined by a rod upon which one of the ends can slide, to accommodate different lengths of shafts.

The construction is shown in Fig. 2. Since the fulcrum is at *C*, the distances *A* and *B* must be equal in order to secure equal angular movement.

In use, one shaft is laid upon the surface plate, and

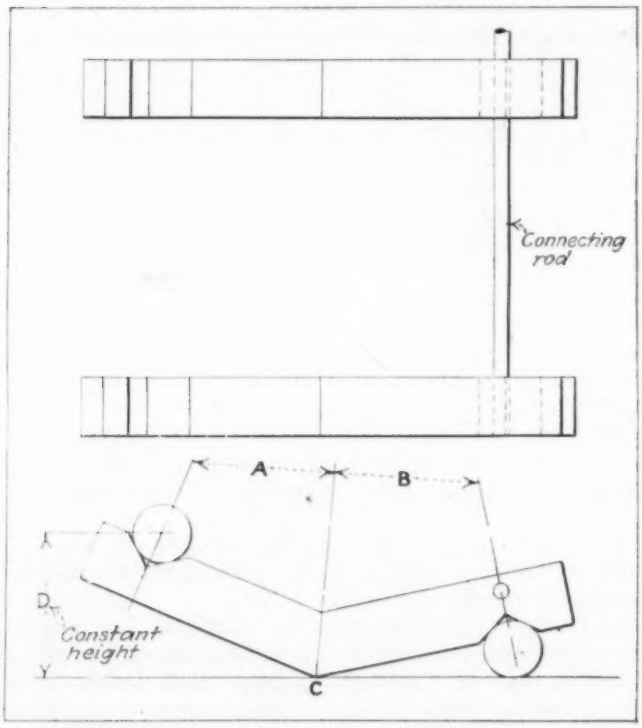


Fig. 2—Details of constant center double Vee-block

the shaft to be marked is placed in the upper vee. Regardless of the size of the work, the center distance *D* is constant, provided a shaft of the same diameter is used in the other vee.

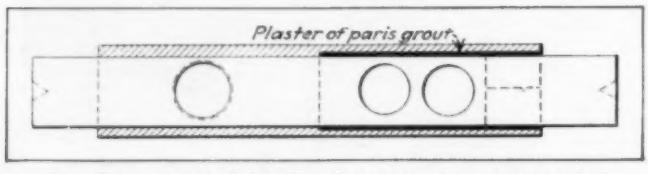
Obviously, only light or medium sized work can be held in the upper vee when the other end of the fixture must be held down by the pressure of one hand, but the principle can be applied to heavier work by using some form of clamp to hold the vees in position.

Making a Temporary Stepped Mandrel

By E. Robert Vogel
Oakland Motor Car Company

The hardened piece shown in the illustration presented some difficulty in grinding the exterior. It had to be mounted on a mandrel because the square hole in the right-hand end was not finished well enough to permit the accurate fit of a square center. The longitudinal hole is of two sizes, the smaller part of which had to be concentric with the outside, while the larger part is merely for clearance and is not accurately finished. For this reason it was not possible to mount the piece on a stepped mandrel. If mounted on a standard mandrel, the part containing the clearance hole would be unsupported for too great a length for accurate grinding.

The difficulty was gotten over by mounting the piece on a standard mandrel and pouring grout made from plaster of paris in the space between the mandrel and the inner wall of the clearance hole. There was no difficulty in grinding the piece the next day, for the grout had become hard overnight. After the piece had been ground and the mandrel removed, the plaster of paris was cut out with a knife.

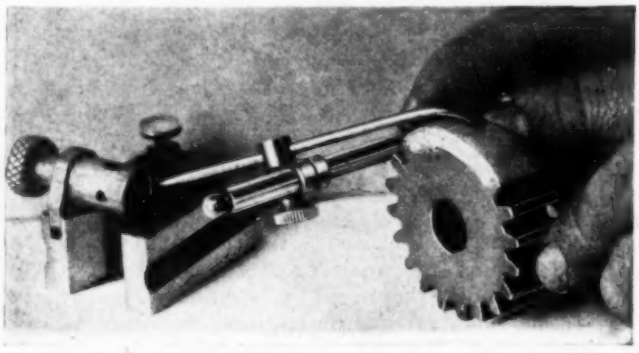


How the part containing the clearance hole was supported

Finding Centers of New Teeth in a Repaired Gear

By H. Moore
Hamilton, Ontario, Canada

In repairing a gear in which some of the teeth have been broken, the general practice is to fill the space left by the broken teeth by depositing new metal by welding. After the new metal has been deposited, it is necessary to turn it to the outside diameter of the gear and, in small shops having no gear cutter, to lay off the centers



Laying out centers for new teeth

for the new teeth, so that the spaces between them can be filed out.

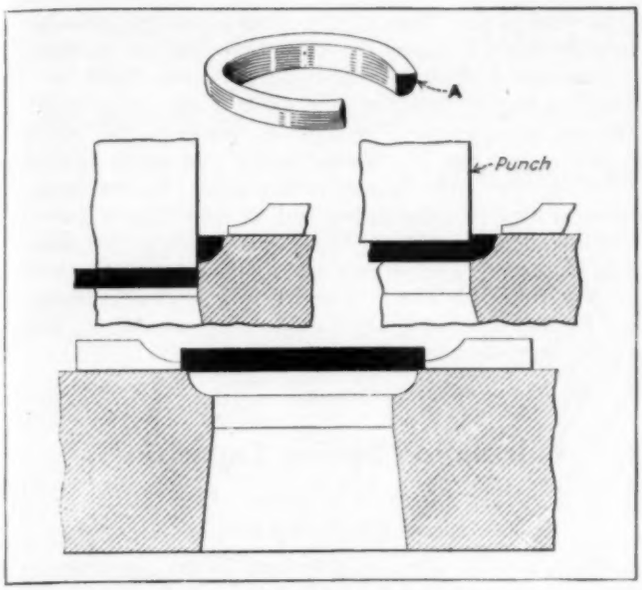
For laying out the centers of the teeth, I take the spindle out of my surface gage, lay it in one of the tooth spaces and set the scriber to the center of the top of a tooth about three or four teeth away. Then I lay the spindle in a tooth space near the deposited metal and draw it along, so that the scriber marks a line in the position of the center of where the tooth will be.

For each successive tooth, the operation is repeated, moving the spindle into the next tooth space. The illustration shows the method.

Combination Die for Making Lead Gaskets

By L. L. Locke

It was recently necessary to make a quantity of lead gaskets to be used as seals in pipe unions. The design was such that one of the corners had to be rounded, as shown at *A* in the illustration. At first, we intended to stamp the gaskets and then machine the rounded edges,



Press tools for making lead gaskets

but on second thought we decided on swaging them. After analyzing the problem more thoroughly, the press tools shown in the illustration were developed.

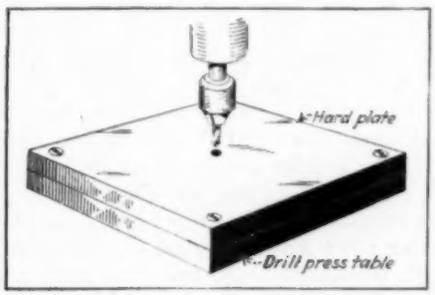
The gaskets were first blanked to the proper diameter and were then inserted in the die, being centralized in a nest. The die had a formed recess corresponding with the radius desired for the rounded corners of the gaskets. In operation, the punch forces the blanks into the die, drawing them into a cup shape and rounding the edges. Further downward movement of the punch pierces the holes in the center, forcing the slugs through the die. The die may be considered a combination drawing and piercing die, in that the blanks are first drawn to shape and then the center openings are pierced.

Accurate Drilling of Small Holes
Discussion

By Wm. C. Betz

In an article under the title given above, on page 232, Vol. 72, of the *American Machinist*, Charles Kugler says that when the drill-press table is in good condition, he uses four steel balls under his work for accurate centering of the drill. But why not have the drill-press table in A-1 condition at all times? It can be kept in good condition at a small cost, as we have done in our toolroom in the following manner:

We made an auxiliary plate, hardened and ground, and screwed it to the drill-press table, as shown in the illustration. This method of covering a drill-press table has the advantage that the plate cannot be drilled into, and also that it can be made to stand at 90 deg. to the center line of the spindle by shimming. For this adjustment, the screws holding the plate are loosened and the plate is shimmed up with thin sheet metal or paper. The plate should be made heavy enough so as not to be sprung when the screws are tightened.



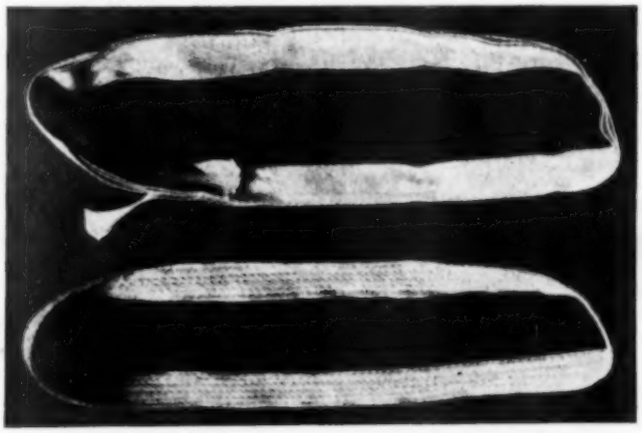
Adjustable, auxiliary plate for drill press table

Making Endless Belts

By Arthur V. O'Brien
Dept. of Mechanical Engineering, State University of Iowa

Not the least of the difficulties encountered by the maker of experimental apparatus is that of providing belts for high-speed drives from motors and the like, belts that will conform to the shapes of the pulleys and will run without the vibration caused by the pounding of lacings over them. There are likewise many occasions when a new belt must be provided for a high-speed internal grinder, or a high-speed drill press, at a time when the regular, woven, endless belt is not immediately available.

In such emergencies, a very acceptable substitute can be made from the cotton tape sold in dry-goods stores, although a more durable article and less likely to stretch, may be made from the linen tape used for winding the coils of motors and generators. The material known as webbing is also excellent for the purpose, as fewer plies are necessary than in the case of the tapes.



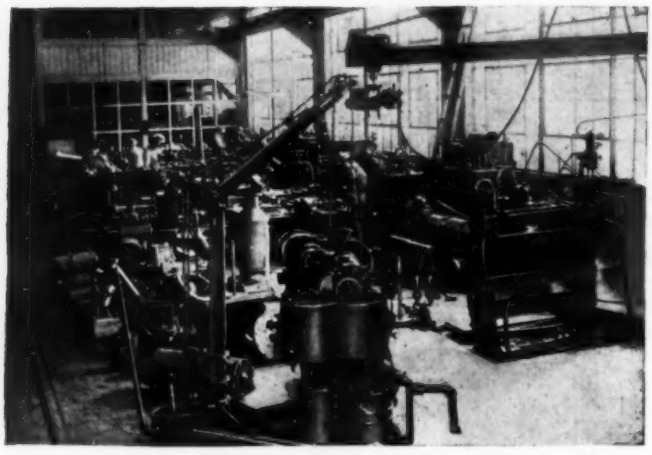
Above—Belt of several plies pinned and ready for stitching. Below—Belt after being stitched

In making the belt, the tape or webbing is wound about the pulleys and drawn tight, taking as many turns as necessary to get the desired thickness. It is then pinned in a number of places, removed from the pulleys and stitched on a sewing machine. Such a belt is shown in the illustration. A belt like the one shown, made of four plies of 0.007-in. linen tape, ran three years on a high-speed drill press with very little attention.

Handling Air-Brake Parts in a Japanese Shop

By Fred H. Colvin

That economy in material handling is an important item even where labor costs are low is shown by the appliances found in the air brake repair department of the Japanese Government Railway shops at Omiya,



Handling equipment in a Japanese air brake department

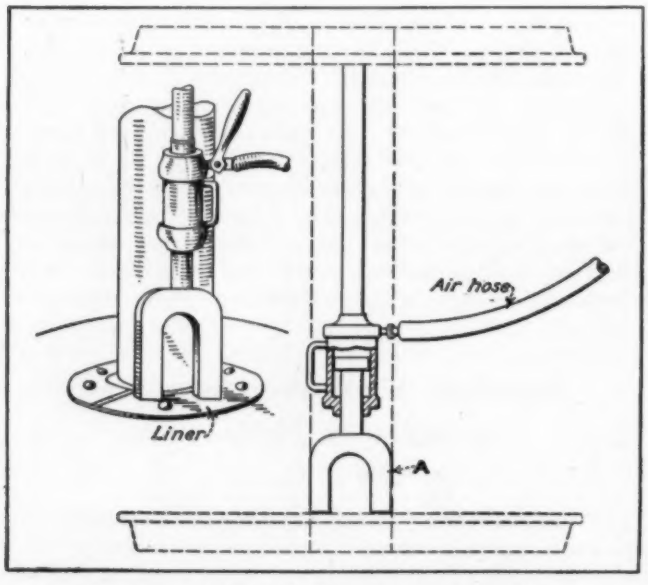
Japan. In this corner of the department all the heavier parts, such as the air pumps and brake cylinders, are handled, the handling equipment including a light overhead traveling crane, a swinging jib crane, and the portable crane shown in the foreground in which a compound air pump is ready to be moved wherever it is wanted next. This portable crane has a hand-operated hoist.

An air motor is provided, however, for the hoist on the swinging jib crane, the air hose being shown under the arm. The traveling crane has electric power. The equipment of this department is an indication of the progressive ideas found throughout the plant.

Air-Operated Clamp for Holding Hub Liners

By C. W. Frank

In welding hub liners to locomotive driving wheels, it is sometimes difficult to hold them securely in place while the welding is being done, with the result that the under sides of the liners will not be properly seated against the wheel hubs. To overcome any possible looseness in performing the operation, the air-operated clamping device shown in the illustration was built.



Clamp for holding hub liners in place for welding

The device consists of a 3-in. air cylinder, the plunger of which bears agains the yoke *A*, while to the upper end of the cylinder is attached a bar that abuts against the hub of the other wheel on the axle. In operation, admission of air to the upper end of the cylinder forces the plunger against the yoke, thus holding the liner firmly in place. The wheels are so placed that the axle is in a vertical position. The welding is done through holes in the hub liner, the clamp being moved so that the yoke straddles each hole in turn.

Calculating Spring Capacities

By Jacob H. Finkelstein
Universal Engineering Service

Springs are an indispensable item in the construction of many kinds of press tools, and the satisfactory working of such tools depends considerably upon the correct carrying capacities of the springs used. It is not very difficult to specify the proper springs for any die design if the draftsman will make use of the formulas given below. They are very simple and have proved satisfactory for calculating springs for all kinds of dies.

For round-wire springs: $P = \dfrac{Sd^3}{2.55D}$

For square-wire springs: $P = \dfrac{Sd^3}{2.12D}$

In which P = Maximum carrying capacity of spring in lb.
S = Shearing strength of steel wire (95,000 lb. per sq.in.
d = Diameter of round wire or side of square wire.
D = Mean diameter of spring.

For satisfactory operation, springs should not be strained beyond 65 per cent of their maximum carrying capacities.

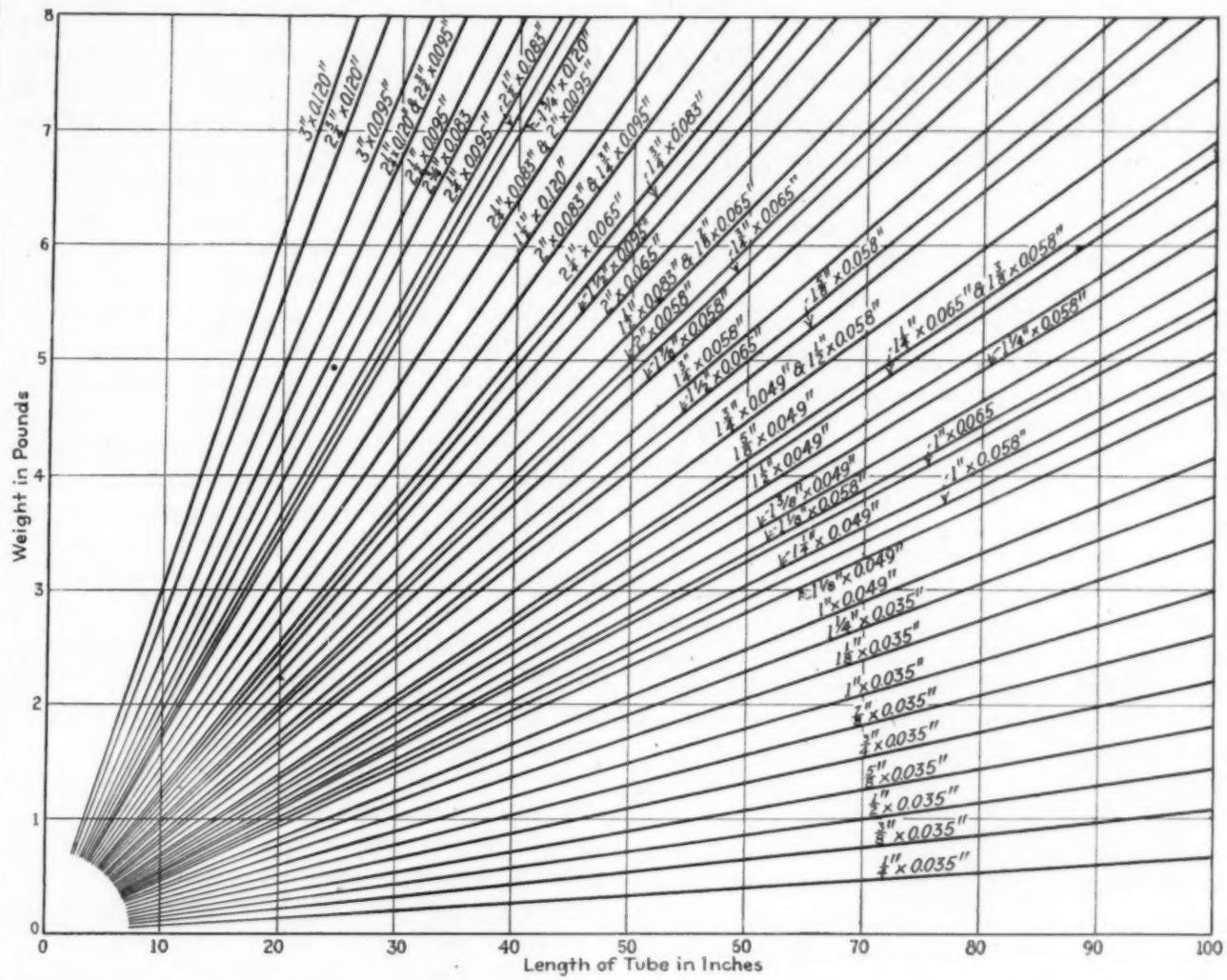
Detecting Cracks in Metal Articles

By W. E. Warner
London, England

Surface cracks in metal articles can be detected in the following manner: If the articles are small, clean them in a hot soda solution and immerse them while warm in kerosene oil. When withdrawn they should be wiped dry and coated with whitewash. When the whitewash is dry they should be struck several blows with a mallet. If there are any cracks, the oil that will have worked into them while immersed in the kerosene will work out and show up as dirty marks on the whitewashed surface.

If the articles are too large or too heavy to be cleaned by immersion in the hot soda solution, wash them with the solution, then dry them and paint them with kerosene. After a few minutes, wipe off the kerosene and coat them with whitewash. A few taps with a mallet will cause any oil in the cracks to work out and leave discolored marks on the whitewash.

Tube and Bar Weight Charts



VERY often the draftsman, inspector, shipping clerk, or shop man is confronted with the problem of figuring the weight of a series of tubes or bars of various sizes, gages, or lengths. By making up a weight chart similar to the one shown for those items which are figured often, a considerable amount of time is saved, both in convenience and in elimination of interpolation for odd sizes. The chart can be drawn on cross-sectional or ordinary tracing cloth in order that blue prints may be made and distributed to interested parties.

The accompanying chart was developed for standard seamless round steel tubes, with the length in inches along the base line and the weight in pounds along the vertical ordinate. Thus, for example, if the weight of a 1¾ O.D. by 0.065-in. tube, 75 in. long is required, the intersection of the tube line and an ordinate from the 75-in. point determines the weight when extended to the vertical ordinate. The weight can be read direct, in this case being 7.32 pounds.

Similar charts may be drawn for brass, copper, or alloy tubes, and for bars of any shape and of any metal, including extruded shapes, providing the weight per foot is known. The same principle may be adapted to a number of other uses in the shop, to depict graphically those items which ordinarily take laborious computation or searching through a book of tables.

Idea suggested by Morton Schwam, design draftsman

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Charging for Spare Parts

CHARGES for spare parts are always a problem for manufacturers, and frequently a source of heated argument. Repair part prices undoubtedly have some effect on decisions to purchase new machines, especially those in which replacements are likely to be needed at frequent intervals.

One of the points often overlooked by the customer is the cost to the manufacturer of carrying spare parts, especially those for obsolete machines. If the customer could visualize the amount of money tied up in special bolts, gears, and other parts he would not expect to get them at the same price as similar parts taken from current production storage. One fire engine builder carries half a million dollars in spare parts, some of them dating back twenty years. Storage space, handling, and inventory, as well as interest on the capital invested, must all be considered in determining prices for these parts. On parts in current production these charges need not be a burden on anyone.

Considering the charges mentioned, which in the case of castings must also include patterns and pattern storage, it seems logical that the price of a part not in current production should increase with its age. Each month and year adds to the cost of the part to the maker. After a reasonable time, therefore, the customer should be willing to pay on an ascending scale in order to keep his machine in operation.

Such a plan would also help in determining the time for scrapping obsolete patterns and tools. When the accumulated charges approach the cost of making a new pattern for the possible replacement order, there should be no hesitation in scrapping the pattern. Orders for these parts then become special and require a pattern, the cost of which must of course be paid by the customer. This plan might have a salutory effect in making the manager decide to buy a new machine rather than to patch up the old one.

The Dismissal Wage

MANAGEMENT is paying an increasing amount of attention to the human side of life, including the responsibility of industry towards its employees. Laying men off or shutting down a plant was formerly a tragedy to be expected and borne as best it could. Savings, if any, vanished under the drain of unemployment and there was no recourse except to the soup kitchen.

While there has been no general radical change, and men are still laid off with little regard to what becomes of them, some of our largest companies are giving the matter serious attention. Three notable examples are found in the Firestone Tire & Rubber Company, the U. S. Rubber Company, and the Delaware & Hudson Railway. These companies have established a schedule of payments to men dismissed or laid off, depending on their length of service. The Firestone Company, for example, pays one month's salary to those who have been with the company at least five years, doubling this when the service is over ten years. The Delaware & Hudson Company makes the payment dependent on the employees belonging to some of the insurance groups of the company.

There are several angles to the question. Among them are the effect on the community when large numbers of men are thrown out of work, and also the effect on the shop executive. A dismissal wage serves as a check on indiscriminate firing since it shows very plainly which executive discharges the greatest number of men. Japan has drastic laws concerning the discharge of employees, wage payments being compulsory over a long period in some cases. The effect is sometimes disastrous to a small concern.

Students of the subject feel that a way must be found for distributing the burden over industry in general rather than requiring that it be borne by the individual business. Some satisfactory form of insurance may yet be worked out.

*

What Are Your Terms?

ON ANOTHER page of this number appears a tabulation of credit terms as gathered from all his vendors by an outstanding American manufacturer. They are both disappointing and enlightening, but every man connected with manufacturing may well study them with profit to himself and to his firm. They call for renewed efforts on the part of every credit department.

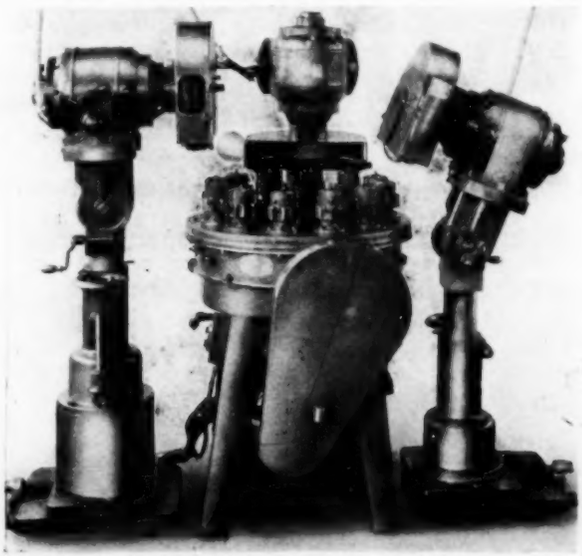
SHOP EQUIPMENT NEWS

"Cipco" Polishing and Buffing Machine

THREE polishing and buffing operations can be performed with one handling of the work on the "Cipco" automatic machine announced by The C. I. Packer Tool & Die Company, Britannia St., Meriden, Conn. The machine is adaptable to many types of work up to 7½ in. in diameter, and because of the simple construction of the expansion chucks holding the work, the changeover from one job to another requires only a short length of time. It is claimed that the increase of production over other methods is from 300 to 500 per cent.

The table of this automatic polishing and buffing machine is operated by a multi-speed motor, allowing the table, which revolves with intermittent motion, to be run at four speeds. The period of dwell while the work is in contact with the wheels is determined by the nature of the work. As the spindles revolve to a position directly in front of the operator, the jaws of the chuck holding the work contract automatically. This action controls four spindles simultaneously, allowing the operator ample time for removing finished work and reloading. The expansion of the chuck jaws occurs automatically just before the work makes contact with the first wheel, and they hold the work securely throughout the polishing or buffing operations. The only special requirement for work of the above size or smaller is that the adaptor jaws must be made to fit each particular job.

Three ball-bearing, motor-driven, adjustable heads, or jacks, can be set so that the wheels will contact with the work as the revolving expansion chucks advance into position. The height adjustment of these jacks is controlled by a handwheel on the side and a 90-deg. adjustment of the motor and buff wheel from the horizontal to the vertical is controlled by a gear and crank. The jack can be adjusted longitudinally by adjusting screws operating in the floor base, and the motor can be swiveled on the base mounted on the saddle. By this adjustment it allows the wheel to be set diagonally in relationship to the surface being finished.



All of the three buffing and polishing heads are adjustably mounted so as to handle a great diversity of work on the "Cipco" Polishing and Buffing Machine. Capacity is for pieces up to 7½ in. in diameter

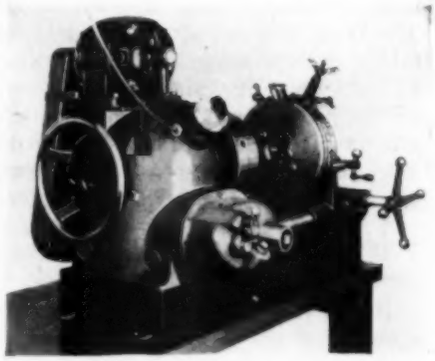
Each motor on the adjustable heads is controlled by a separate snap switch for starting and stopping, and the multi-speed motor, which operates the work table, is controlled by a starting switch, and also a four-speed controller box. In addition to these, there is a push-button switch attached to the machine to be used by the operator for starting and stopping in case of emergency. All of these electric controls are supplied with the machine, together with the three jacks.

The table is operated by a gear mechanism submerged in an oil reservoir. The gage at the side shows the oil level, and the drain cock at the bottom permits changing the oil when necessary.

The motors supplied on the jacks are of 3 hp. at 1,800 r.p.m., and are furnished for either two- or three-phase. The driving motor for the table is a multi-speed, constant-torque type, also of 3 hp. on 60-cycle, 220-volt current. The floor space required by the machine is 60 x 72 in., and the net weight is 2,513 pounds.

Oster Improved Bench-Type Pipe Threading Machine

The Oster Manufacturing Company, Cleveland, Ohio, is now equipping all "Willie-Williams" portable power threaders with "Domestic Electric" universal motors, formerly used only on the Oster "Power Boy" threader. It is claimed that this motor not only speeds up production, but also eliminates the tendency toward stalling, because the speed of motor is in direct proportion to the pull on the dies. The "Willie-Williams" portable power threader can also be furnished in either bench or pedestal types. It is claimed that either type gives the operator the advantages of a large power-operated machine, with the added feature of portability.



Portable Power Threader available in bench and pedestal types from the Oster Manufacturing Company

Among the other features of the machine are the built-in cutting-off,

reaming, and chamfering tools, the built-in quick-opening, diehead, the geared pump, and the two powerful chucks, one a heavy gripping chuck and the other a self-centering chuck.

Both the bench type and pedestal type machines will thread, cut, ream, and chamfer from ¼- to 2-in. pipe.

Norton Type "D" 28-Inch Roll Grinder

MANUFACTURERS engaged in the cold rolling of metals such as steel, nickel, gold, silver, platinum, zinc, brass, and foil, are being called upon for higher standards of quality both in uniformity of gage and character of finish. To aid in this work, the Norton Company, Worcester, Mass., has developed a line of roll grinding machines and also grinding wheels.

One of the machines recently placed on the market by the above concern is the 28-in. Type "D" machine illustrated, which is built in lengths from 96 in. up. The design of this machine is not a radical departure from previous models, but does incorporate many features and improvements. The proportions of the base and tables and the wheelslide are such as to insure rigidity, and the alignment of the parts is such as to permit the attainment of high grade finishes on large rolls. Among other features are flood lubrication of the table ways and the spindle bearings, and multiple V-belts for driving the spindle without vibration.

It is claimed that with this machine a quality finish may be produced with fewer wheel changes than has ordinarily been the case. Older practice is to rough grind with not finer than 60 grain, then with 100 grain or 150, followed by 200, and finally with 400 or 500 grain for the final polish. However, rolls are finished in the Type D machine as shown by the table on this page.

The selection of wheels depends to a great extent on the size of the roll and the degree of hardness. The table, however, covers a fairly wide range.

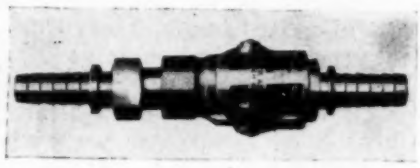
It is claimed that this method of grinding has reduced the time considerably. The following is an example which is claimed to be typical of the rate at which large rolls are finished: Three chilled iron rolls 24 in. in diameter by 30 in. long were ground to a highly reflective finish, removing about 0.030 in. from the diameter, in a total of 25 hours. This time included not only the roll bodies, but a high finish on the necks and fillets as well. Formerly 39 hours were required and the finish was not so good.

Method of Grinding Large Rolls

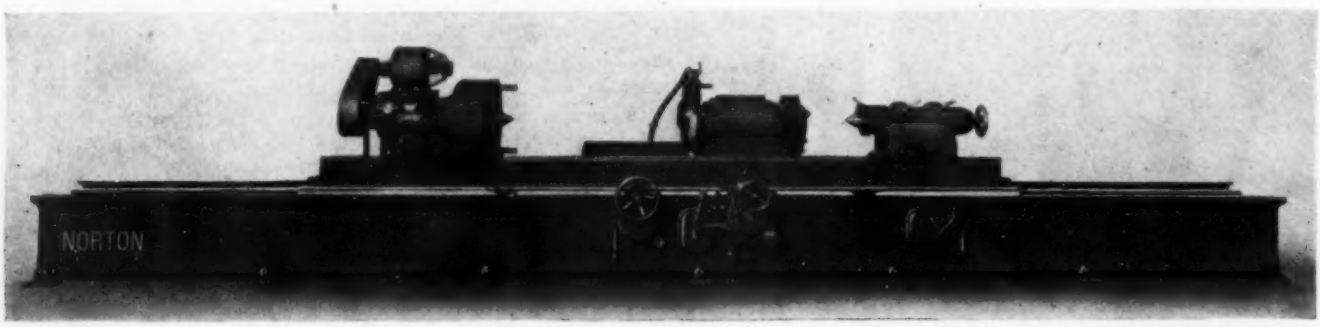
I. New Rolls—Hardened Steel	
1. Rough grind	46 DK Alundum vitrified
2. Semi-finished grind	100 I Crystolon vitrified
3. Finish grind	400/A Grade I Crystolon shellac
II. New Chilled Iron Rolls (rough turned)	
1. Rough grind	36/B-T2 or T3 Alundum Bakelite
2. Finish grind	same wheel
III. Regrinding Hardened Steel Rolls	
1. Rough grind	100 I Crystolon vitrified
2. Finish grind	400/A Grade I Crystolon shellac
IV. Regrinding Chilled Iron Rolls	
1. Rough grind	36/B-T2 or T3 Alundum Bakelite
2. Finish grind	same wheel

"Quick-As-Wink" Valve Coupling

The by-pass principle is incorporated in the "Quick-As-Wink" shut-off valve and coupling recently announced by C. B. Hunt & Son, Salem, Ohio. A quarter-inch push



"Quick-As-Wink" Shut-Off Valve and Coupling, which requires only a ¼ in. push or pull to turn the flow of air on or off



Large size rolls for the cold rolling of ferrous, non-ferrous, and precious metals may be ground to a highly reflective finish in quicker time on the Norton Type D Roll Grinding Machines, of which the 28-in. size is illustrated. These grinders are available for rolls 96 in. in length and up. V-belt drive prevents vibration

or pull on the outer member is the only movement required to turn the flow of air on or off. The device permits air to be shut off anywhere on the hose line, automatically bleeding air for removal of tools for repairs or oiling. It is claimed that, in spite of the free-swiveling of coupling and valve, they are air tight at pressures up to 1,000 lb. per sq. inch.

"Quick - As - Wink" valves and couplings are made in all sizes from ⅛ to 4 in., and to fit all common types of hose or pipe connections.

Standardized Flange Spindle Nose on Monarch Lathes

SINCE the National Machine Tool Builders Exposition last Fall, most of the lathes built by The Monarch Machine Tool Company, Sidney, Ohio, have incorporated the flanged spindle nose. It now appears to be the preferred type, and has been adopted as standard by the above concern.

As a result of using the flanged spindle nose, it is claimed that the machine user can obtain faceplates and chucks from most manufacturers of these accessories to fit perfectly on the spindle. It is also claimed that a faceplate may be removed and replaced on the nose and lined up within 0.0002 in., irrespective of the number of times that this is done. The change can be made in about one minute. Chucks, faceplates, and fixtures are machined to working gages, allowing 0.004-in. draw fit against the locating flange, which centralizes all chucks and fixtures.

The Monarch spindle is an upset forging, the flange being forged integral. The short tapered centralizing section and the flange, as well as the outside diameter, are ground, locating from the journal bearings of the spindle. The taper hole in the spindle is also ground. There are no threads in the flange, and the studs are anchored in the body of the chucks, faceplates, and fixtures, so that nuts on the back of the flange are used to hold these items on the spindle nose.

Monarch Standardized Flanged Spindle, which has been adopted as standard on the 14 in. lathe and up

It is thus possible on a toolroom lathe to bolt a piece of work on the faceplate, remove the plate any number of times, and put it back on the spindle nose again without removing the work from the faceplate. It is further claimed that the work will be perfectly centralized every time.

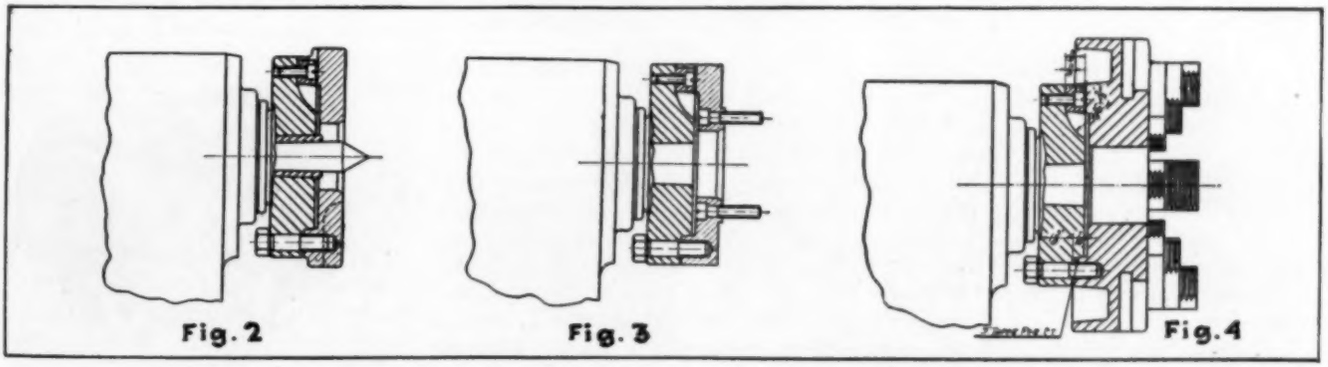
No adapter plates are necessary in mounting chucks. The chucks fit directly on the spindle nose, thereby eliminating overhang and greatly increasing the rigidity of the mounting. The driver key eliminates all driving strain from the studs, which are merely used to hold the chucks and faceplates on the spindle nose.

Two sizes of spindle noses cover the entire Monarch range from 14- to 36-in. swing lathes. The 8¼ in. diameter flange is used on all lathes up to and including the 20 in. size, whereas the 11 in. nose is used on all larger machines.

"Radiac" Type C Cut-Off Machine

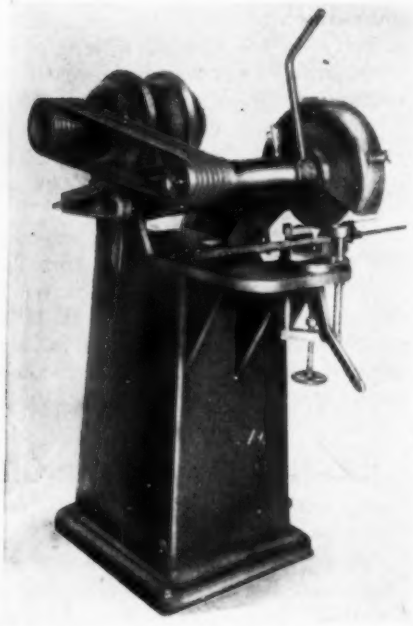
Tubing and round and square bar stock can be cut-off rapidly on the "Radiac" Type C cut-off machine announced by A. P. de Sanno & Son, Philadelphia, Pa. The material which can be cut includes both cold-rolled and high-speed steel, tempered and hardened drill rod, chrome-molybdenum and manganese steel, chilled, cast, and stainless iron, alloyed aluminum, reinforced brake lining, and various compositions. It is claimed that solid stock up to 2 in. in diameter can be cut so quickly that the heat generated is not sufficient to draw the carbon or temper. The average time of cutting 1 in. of square stock is about four-fifths of a second. The wheel wear varies with the nature and size of the material to be cut.

The spindle speed is 5,000 r.p.m., and a 12-in. wheel travels 15,700 peripheral ft. per min. The ball-bearing wheel spindle revolves in oil, and is multiple-belt-driven by a 7½-hp.



Details of a Monarch Standardized Flanged Spindle Nose

Fig. 2—Standard 8¼-inch flanged spindle nose. Fig. 3—Adapter plate for mounting old chucks. Fig. 4—Chuck machined to P & W gages to fit the Monarch flanged spindle nose without an adapter plate



"Radiac" Type C Cut-Off Machine for stock from ¼ to 2 in. in diameter

motor. The head, which supports the motor on the rear and the wheel spindle at the front, is balanced, and is movable up and down. A suitable guard with a removable cover practically incloses the wheel, the rear of the guard deflecting the sparks and dust into a water pan.

The clamping device consists of two V-shaped holders in which material, ranging from ¼ to 2 in. in diameter, is held by two adjustable equalizing clamps, which permit the operator a clear view of the cut. The clamps are raised and lowered by an eccentric hand lever and adjusted by a regulating screw. The wheel is drawn to the work, which is held stationary.

Angle cuts up to 45 deg. may be made, but by machining the V-blocks slightly, it is possible to cut up to 60 deg. At an additional cost, a turn table can be furnished for holding the flat stock, not exceeding 2½ in. wide, in which straight or angle cuts may be made. Various cuts may be made either straight or at an angle as follows: Points on drills, diamond shapes on tool bits, mitres, grooves, and triple points. It is also said that tempered dies may be altered without annealing.

The machine weighs 1,200 lb., and occupies a floor space of 45 x 27 x 57 in. It takes a wheel 12 in. in diameter by $\frac{3}{32}$ in. thick.

Rivett Speed Box Motor Drive for Bench Lathes

For use on its own bench lathes or those manufactured by other concerns, the Rivett Lathe & Grinder Corporation, Brighton, Boston, Mass., has announced a speed box motor drive. In addition to doing away with overhead belts, the starting and stopping of the lathe, and changing from the low range to the high range speeds can be effected without manual gear shifting. This is desirable inasmuch as many jobs on bench lathes require both hands to be occupied.

The speed box motor drive is attached to the under side of the bench or oil pan stand, or mounts inside of Rivett oak cabinet. Any standard a.c. or d.c. motor of suitable size can be mounted on the rear face of the speed box. Drive is by silent chain from the motor to the lower shaft of the speed box, avoiding the use of a flexible coupling or the necessity for exact alignment. Two pairs of helical steel gears constantly in mesh are mounted on heat-treated and ground shafts carried in Timken roller bearings, all splash lubricated. A three-step cone driving pulley carries a leather belt, which passes through guarded slots in the bench, oil pan, or cabinet top, to the lathe spindle pulley.

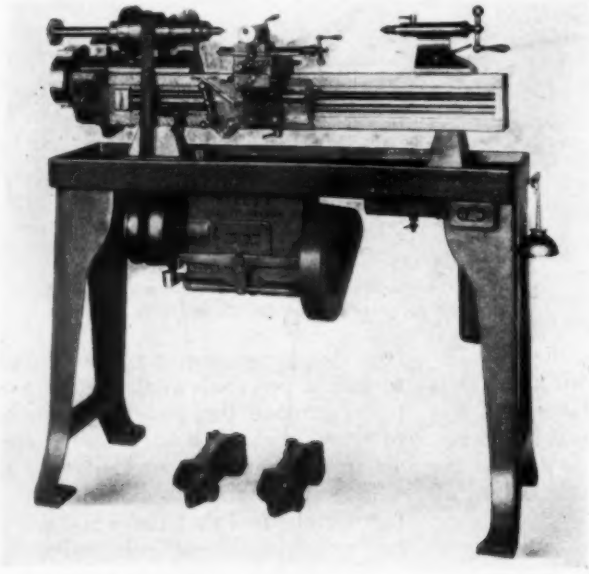


Fig. 1—Rivett No. 608 Backgeared Precision Screw Cutting Lathe equipped with speed box motor drive and latch treadles

A double-end friction clutch inside the box, splash lubricated, engages the low and high-speed drives. This clutch is operated through a rock lever by treadles. Latch treadles afford complete control without obliging the operator to maintain foot pressure during operations, yet permitting him to make an instantaneous change from the low to the high speed or from the high speed to the low speed. The hands of the operator are thus free at all times to manipulate the work and the lathe.

The design avoids any gear shifting and provides complete splash lubrication for all wearing parts. Coil compression springs encased in the speed box housing throw out the clutch and stop the lathe when the latch treadles are released, and as a slight rightward movement of the operator's toe disengages the treadle latch, it is unnecessary for the operator to change his weight from one leg to the other to stop the lathe. A combined filler and gage for lubricant is conveniently located at the front of the speed box. The removable cover plate gives easy access to the clutch adjustment.

Six forward speeds are secured by this drive, and by the use of a reversing switch six reverse speeds are available if required. Through the use of the backgears of the lathe shown in Fig. 1, twelve forward and reverse speeds are obtained.

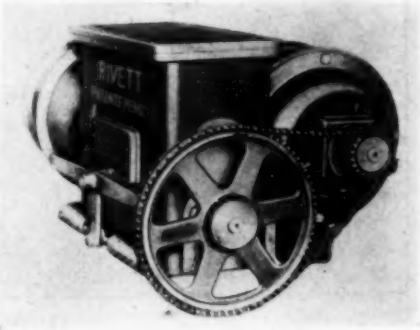


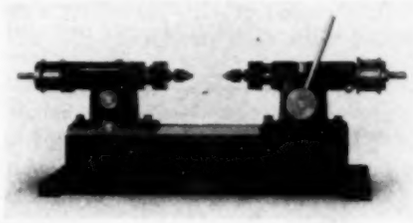
Fig. 2—Rivett Speed Box Motor Drive for Bench Lathes

"Universal" Nitralloy Bushings

"Nitralloy" steel is being used for all bushings manufactured by the Universal Engineering Company, Frankenmuth, Mich. This alloy is said to combine maximum surface hardness with toughness of core and high tensile strength. It also possesses high shock-resisting properties and has resistance to atmospheric and saltwater corrosion.

Langelier Horizontal, High-Speed, Bench-Type Duplex Drilling Machine

Simultaneous drilling or countersinking on the ends of rods or similar work can be done on a production basis on the horizontal, high-speed, bench-type, duplex drilling machine announced by the Langelier Manufacturing Company, Providence, R. I. The drilling heads are bolted to the bed in a fixed position to suit the length of work they are intended for. The drilling spindles are heat-treated and ground, and run in phosphor-bronze bearings. They are provided with ball-thrust bearings for counteracting drill thrust, and are mounted in feed sleeves having a maximum feed range of 3 in. Each feed sleeve has a drilling stop.



Up to ⅝-in. drills can be carried on Langelier Horizontal, High-Speed, Bench-Type, Duplex Drilling Machine

The spindles can be run at a maximum speed of 6,000 r.p.m., and have capacity to take up to ⅝-in. drills. They are fitted with No. 1A or 2A Jacob chucks to suit the size of the drill. Drive to the spindles is effected by ball-bearing pulleys, which can be belt connected to motors or to an overhead countershaft.

The drilling feeds are operated by a hand lever on the right-hand head. The feeds for both drilling heads are interconnected by levers and a connecting lock at the rear.

This type of machine is made in several modified forms, some being mounted on a table or legs with motor drive for each head underneath, and others are arranged with an automatic feed release in the right-hand head when holes have to be drilled through the entire length of the work.

The machine requires a bench space of 36x10 in. and weighs approximately 200 pounds.

Kent 1-Inch Bolt and Stud Pointing Machine

A SEMI-AUTOMATIC bolt, stud, and rod pointer has been placed on the market by the Kent Machine Company, Cuyahoga Falls, Ohio. The pointing head moves forward and back a predetermined number of times per minute and is built in two types. One type has an arrangement for holding the bolt to be pointed by the head, while the other type is provided with a double-jaw gripping attachment, whereby round head bolts, studs, or rods may be pointed.

The pointing head spindle is driven by a silent chain in the motor-driven machines, and by a pulley drive where belt drive must be furnished. The reciprocating action of the cutter head is obtained by a cam which is driven through gearing from the cutter spindle. All gearing and the cam mechanism are contained within the body of the machine. Outside of the body is a set of change gears by which the number of reciprocations of the cutter head may be controlled. Gears for obtaining 25 to 60 points per minute are furnished with the machine, and other gears may be secured for fewer or greater reciprocations if conditions warrant. Also, a socket holding carrier is supplied when the bolts are to be held by the head for the pointing operation, and this carrier has interchangeable sockets for the different diameters of bolt heads.

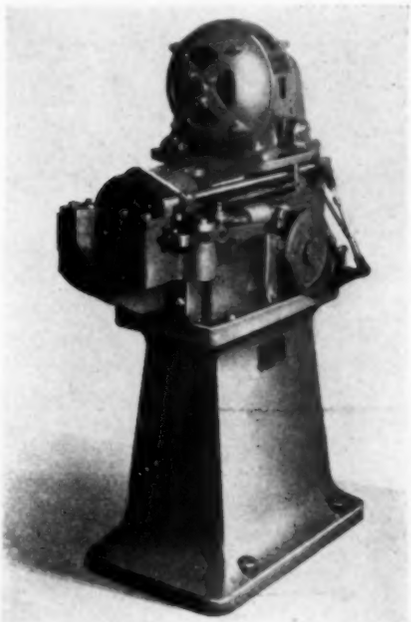


Fig. 1—Kent 1-Inch Bolt and Stud Pointing Machine adapted for holding bolts by the head

Fig. 2—Showing attachment for gripping studs and rods while being pointed

The carrier with socket is adjustable for different lengths of bolts.

The gripping attachment for studs and similar parts is cam actuated with the work held between two grip jaws. These can be furnished for different diameters of work. The mechanism is also provided with a swinging stop for locating the end of the work in relation to the advanced position of the cutter head.

The head carrying the pointing tools is short and sturdy in contruction. Two square tools, rigidly clamped in place, are used. These

tools are easily made and quickly ground. Any type of point can be obtained.

Although this machine is designed especially for pointing, it can be adapted to end drilling, shouldering, hollow milling, and other operations. It will point all diameters of bolts up to and including 1 in. in diameter of any commercial length. The machine is built in bench or pedestal types, and with belt or motor drive.

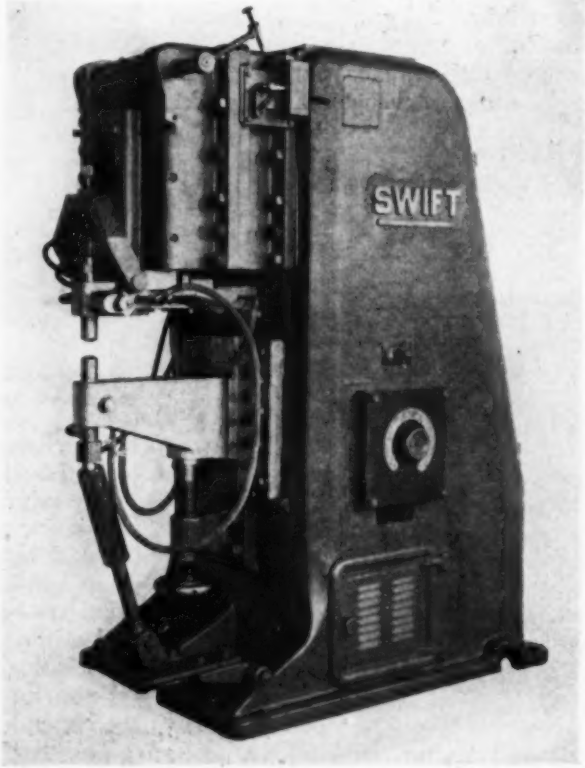
Swift Heavy-Duty Spot Welders

A COMPLETELY automatic spot welder has been placed on the market by the Swift Electric Welder Company, Detroit, Mich. The upper head is operated from a cam and toggle driven through a worm and worm gear reduction. The lower horn may be adjusted to determine the opening between the electrodes. Both the upper and lower electrodes and horns are water cooled. The water is allowed to flow through these parts continuously, thus insuring the maximum cooling effect and preventing the possibility of overheating and damaging the die points during the operation of the machine.

Sliding ways carry the upper horn or head, these ways having long bearing surfaces. They are adjustable by means of taper gibs for taking up wear, and ample provision has been made for lubrication.

The frame of the machine is made of semi-steel, and unit design and construction have been used wherever possible. All working parts are fully inclosed within the housing, and are so arranged as to be easily accessible for oiling and maintenance. The motor, also carried within the housing, can be removed if necessary.

The cam furnishes a means for automatic current control, and the six-point regulator switch permits the determination of secondary voltages, and thus the regulation of heat for welding various sizes of stock within the capacity of the machine. The machine illustrated has sufficient electrical capacity and mechanical pressure for welding two pieces of ½-in. stock. The welder is built in three different sizes, 60, 100, and 150 kilovolt-amperes.

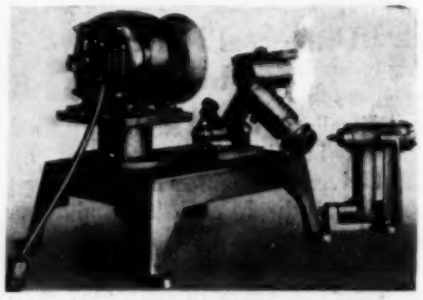


Unit design has been used wherever possible in this Swift 150-Kva. Heavy-Duty Spot Welder, which is also available in 60- and 100-kva. models

Wells Sharpener for Die Sinking Cutters

Any regular die sinking cutter, either of the tapered or ball cutter type, may be sharpened on the machine illustrated. This unit is another model added to the line manufactured by the Wells Manufacturing Company, P. O. Box 613, Greenfield, Mass. It is powered by a ⅙-hp. motor operating on 110- or 220-volt circuits.

Two workheads are furnished.



Either tapered or ball-type die sinking cutters may be sharpened on this Wells sharpening machine

One head is for grinding cutters that are straight or with any needed taper. The cutter is held in a draw chuck and the spindle is revolved by the knob shown. A cam on the spindle causes the work to advance to the wheel and produces a radial relief.

The other workhead is for grinding ball cutters or "cherries." The cutter is held in a draw chuck and a device is provided to locate the cutter for grinding the correct radius. This device will locate cutters of different sizes and radii. After locating and clamping the cutter in the draw chuck, the cutting edge of a tooth is held against the tooth rest, and the workhead and cutter swing past the wheel, which grinds the correct relief on the cutter.

A diamond trueing device is furnished with each machine.

"Toledo" Folding Steel Horse

A folding steel horse, utilizing standard sized lumber as a rail, has been introduced for use in machine shops and other plants by the Toledo Pressed Steel Company, Toledo, Ohio. The metal cross member acts as a toggle, and when this is clamped down, as shown in the accompanying illustration, the jaws grip the wooden rail tightly. The jaws are toothed and bite down as well as in, binding the rail firmly on three sides, thus preventing splitting and side sway. No other bracing is required.

The legs are made from heavy gage steel in the shape of 3-in. ribbed channel sections, with all pivoted joints permanently fastened, although permitting of free and easy movement. The horses are finished in baked enamel and are available in 13

"Toledo" Folding Steel Horse which employs any standard size lumber for a cross rail

sizes of 18 to 60 in. in height. Approximate weight for the smallest size is 18 lb., and for the largest size, 50 lb., from which it will be seen that they are easily portable.

Oster 4-Inch Pipe Reamer

Four-inch pipe on the hydraulic lines of machine tools and other applications may be reamed by means of the hand-operated device announced by The Oster Manufacturing Company, Cleveland, Ohio. The feature of this reamer, illustrated below, is the screw feed, the pitch of which is so designed that sufficient pressure is obtained for thorough reaming. The No. 414 reamer can be used for hand operation by means of two additional handles, but may also be employed with the Oster No. 414 Power Boy. It embodies three replaceable reaming blades. The body is made of malleable iron.

Hand reaming of 4-in. pipe may be done with this Oster No. 414 reamer, which is provided with screw feed

EQUIPMENT ADAPTATIONS

Recently Developed by the Makers

Splitting Bearing Caps on Connecting Rods

From 60 to 75 connecting rods per hour can be put through the operations of splitting the bearing caps and milling the bolt holes when machined on a No. 1403 "Milwaukee-Mil" Simplex with a two-spindle head of the double-decked type. This machine was furnished by the Kearney & Trecker Corporation, Milwaukee, Wis. Special hand

Splitting the bearing caps and milling the bolt holes of two connecting rods, while two others are being loaded

indexing fixtures are used for holding the four pieces, two on each side. Two gangs of high speed slotting and side milling cutters are used to split the bearing caps and mill the several bolt hole bosses.

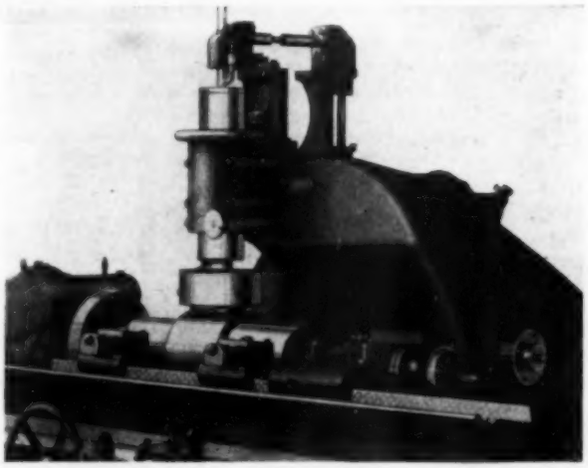
The hand indexing fixture holding two rods on each side is mounted directly on the index base, and two pieces are always in the cut while the operator is loading the opposite side. The two cutter spindles—one above the other—are $6\frac{7}{8}$ in. apart, and as the work feeds into the cutters, the top and bottom bolt bosses are milled simultaneously with the splitting of the cap.

Wrist pin holes and the crankshaft bore are accurately faced on both sides in a previous operation to assure accurate alignment.

Roll Honing Attachment for Cincinnati Plain Grinders

Present demand for high-grade finishes has led to the development by Cincinnati Grinders Incorporated, Cincinnati, Ohio, of equipment for honing parallel and cambered rolls. This equipment consists of a heavily ribbed bracket to be mounted on the wheelheads of the standard 14- and 16-in. plain self-contained grinders. The mechanism consists essentially of a vertical spindle carrying a hone or rotary oil stone mounted in a spring-loaded chuck, the spindle being adjustable vertically and rotated by means of a $\frac{3}{4}$-hp., variable-speed motor mounted on the rear of the bracket. The head carrying the spindle is reciprocated through a 2-in. stroke.

The method of application is to



Both parallel and cambered rolls can be finished for exacting operations by means of this roll honing attachment on a Cincinnati plain grinder

rotate and traverse the rolls at normal grinding speed, bringing the honing equipment into operation until the grain depth of the cut left by the finest grinding wheel that can be employed is removed. This method imparts the highest finish.

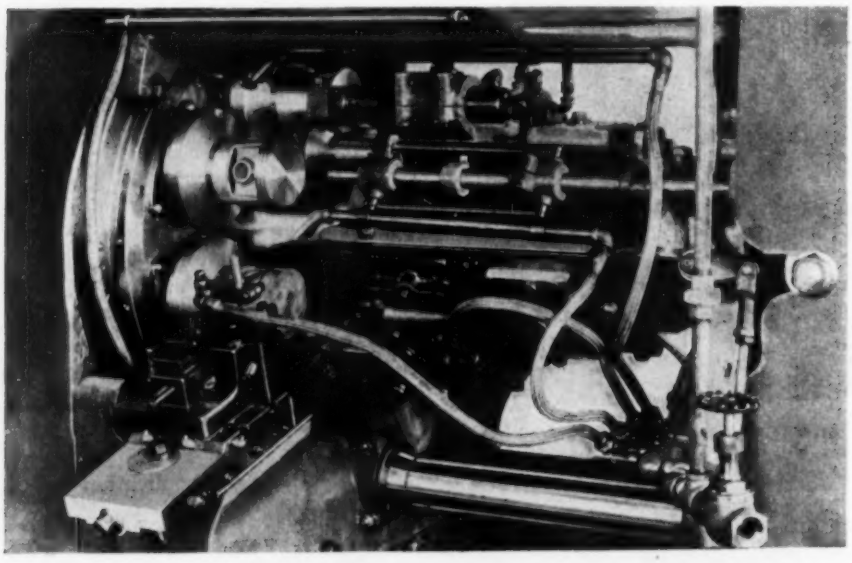
This equipment was developed especially for production of rolls for the finer rolling operations, which require an accuracy even better than the mirror finishes that can be obtained on standard machines.

Machining Pistons on a Baird Chucking Machine

The skirt, the grooves, and the end of an automobile piston may be machined on the five working stations of a Baird chucking machine built by the Baird Machine Company, Stratford Ave., Bridgeport, Conn. In the set-up illustrated, the end is turned in such a way that the tool is removed from the surface without causing tool marks. The skirt is turned with a slight taper. Floor-to-floor time ranges from 15 seconds up per piece.

The piston casting is held in the spindle by a holding fixture using a pin passing through the wrist pin holes in the piston and a corresponding hole in the end of a member of the fixture. As the completed work comes around to the operator, he steps on the lever which withdraws the work locator. Simultaneously he removes the pin and the piston and then locates another casting against a circular part of the face of the spindle. The pin is next slipped in place and the foot lever released, so that the work locator holds the piston until it is firmly grasped by the automatic holding fixture. The machine can also be furnished with an automatic stop, which automatically stops the machine after a cycle and prevents the work from passing through the machine a second time, in case the operator has not attended to the unloading and reloading. The act of reloading automatically releases the automatic stop.

Connected with the work locator is the safety control, by means of which the turret is prevented from indexing while the foot lever is held down. Because of this the operator is safeguarded while loading and unloading the pistons.



Baird Chucking Machine provided with special fixtures to machine the skirt, grooves, and end of an automobile piston. The casting is held by a pin passing through the wrist pin holes

TRADE PUBLICATIONS

GRINDER, HOB AND TOOL. The George Scherr Co., Inc., 142 Liberty St., New York, N. Y., has announced a catalog on the "Reinecker Automatic Hob and Tool Grinder," giving its features, advantages, scope, and capacity, and many figures of set-ups. Specifications and standard equipment are listed. The catalog contains nine 8½x11-in. pages.

HEATERS, UNIT. The American Blower Corporation, Detroit, Mich., has published bulletin No. 9218, superseding 7818, on "Venturafin" Method of Heating for Floor, Wall or Ceiling Mounting." This method of heating is adaptable to high-, medium-, or low-pressure steam applications. The booklet contains descriptions of the apparatus and tables of available sizes, together with piping diagrams. It contains 22, 8½x11-in. pages.

LATHES. The South Bend Lathe Works, 426 E. Madison St., South Bend, Ind., has issued Bulletin No. 18 giving detailed descriptions, illustrations, and prices of its complete line of 18-in., 1930 "New Model" backgeared, screw-cutting, precision lathes and attachments. The catalog contains 16, 8½x11-in. pages in two colors.

MOTORS. The Century Electric Co., 1806 Pine St., St. Louis, Mo., has issued sheet 13-1 on the Types SC, SCN or DSCH, multi-speed, squirrel-cage induction, polyphase motors of ⅛ to 150 horsepower.

MOTOR-GENERATOR SETS. The Reliance Electric & Engineering Co., Ivanhoe Road, Cleveland, Ohio, has issued Bulletin No. 500 on its motor-generator sets, showing the welded steel bases, and giving the characteristics of the motors and generators, together with pictures of various installations. Specifications are also included.

STEELS. The Ludlum Steel Co., Watervliet, N. Y., has produced a very comprehensive and finely printed artcraft looseleaf volume containing information on the following products: high-speed and alloy tool steels; corrosion-, heat-, and wear-resisting steels; valve steel, and Straus metal. Information on these products is very accessible and an index is provided. Various data are also conveniently arranged throughout. Many full-page pictures combine to make the catalog attractive. Space is provided for the inclusion of subsequent publications.

"ENGINEERING ACHIEVEMENTS, 1929." The Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., has published a booklet, "Engineering Achievements, 1929," which shows an amazing diversity of interest and achievement in products from massive transformers and turbine generators down to dental tools and small meters.

FITTINGS, DIAMOND CORE DRILL. The U. S. Department of Commerce, Bureau of Standards, has issued Commercial Standard CS17-30 entitled "Diamond Core Drill Fittings." Copies may be obtained from the Superintendent of Documents, Washington, D. C., for $0.10 each.

NEWS
OF THE WEEK

General View of the Arena

Huge Transport Planes Are Features At New York Aviation Show

SIZE was the most impressive feature of the New York Air Show in Madison Square Garden from May 3 to 10. Six planes took the available floor space of the huge arena and even then they had to be staggered so that the wings would not interfere.

Largest was the Fokker F-32 monoplane, with a wing span of 99 ft. and a length of 70 ft. 2 in., powered with 4 Hornet engines of 525 hp. each. It carries 32 people in a comfortable, roomy cabin made up of several compartments. Next in size came the Consolidated "Commodore," with a 100-ft. span, carrying 22 passengers and powered by two Hornet engines. The Curtiss Condor, carrying 20 passengers, with two Curtiss Conqueror engines totaling 1,250 hp., a double-hulled Savoia-Marchetti carrying 7 people in each hull and pilots in the wing, and the Ford tri-motor carrying 13 passengers were the other transport planes. There was also a "cut away," full-size model of the new Sikorsky 41-passenger, ocean-going, amphibian, soon to be put in service by Pan-American Airways.

Smaller planes were suspended above and were also shown on the lower floor, together with motors and accessories of various kinds. In this connection it is well to note the growing interest in instrument equipment, none but the best known brands being in evidence on planes of standard makes. The unreliability of the human impressions as to direction or altitude are being recognized as the cause of some of the worst crashes and the large transport companies are requiring pilots who can fly by instruments rather than by "feel."

Many compilations of statistics were shown, one of the most startling being a comparison of the growth of the automobile and airplanes industries during the first nine years of their existence. Monoplanes are growing in favor, especially in the larger sizes and even the smaller planes seem to be coming to the single wing. Cantilever wings are also on the increase, and thicker wings, thick enough to carry the engines and pilots inside, are apparently on the way. So are tandem engines and propellers.

The Packard-Diesel engine was exhibited for the first time, and was also shown on some of the planes exhibited. While radial engines predominate, the straight-in-line engine is shown in increasing numbers, with the inverted type finding many advocates. Nor does light weight per horsepower find particular advantage with either radial or line type, especially in the larger powers, the Isotta-Fraschini W-1,800 hp. weighing but ¾ lb. per horsepower.

The huge transport planes are said to be but forerunners of even larger planes to come in the near future. Rumor has it that the large plane builders are planning for ships of the air to carry many more people and at speeds much faster than at present. Where the present planes cruise at about 125 miles per hour, the new ones are to be designed for 200 miles per hour, and night travel by air is to become as common as by rail.

Steel Leaders Optimistic Over Trade Outlook

Only a fair amount of new business is needed to bring activities of the iron and steel industry to normal levels, and there is every expectation that the required demand will develop toward the end of this year, according to the composite opinions of steel leaders attending the twenty-seventh general meeting of the American Iron & Steel Institute in New York City on May 9.

The basic strength of the steel industry is emphasized by the fact that every fabricating plant in the country has four or five months work represented by unfilled orders, according to James A. Farrell, president of the U. S. Steel Corporation. Mr. Farrell said further: "There is nothing wrong with the steel industry. Business today is very good. Production of the country is not down to 79 or 80 per cent, but up to 79 or 80 per cent."

Charles M. Schwab, chairman of the board of the Bethlehem Steel Corporation, delivering the principal address, emphasized the fact that the finding of new uses for steel had produced a diversification of demand which made the industry more resistant to the fluctuations of demand than formerly, specifications from one source tending to offset lessened demand from other interests.

Eugene G. Grace, president of the Bethlehem Steel Corporation, stated that conditions and activities in the steel industry and that operations of the Bethlehem company were about unchanged from a few weeks ago. Republic Steel Corporation is operating around 75 per cent of capacity, according to Tom M. Girdler, chairman and president. Mr. Girdler stated further that he is optimistic on the business outlook. Encouraging signs for the steel industry, he added, were betterment in the demand from automotive sources and a distinct firming of steel prices.

L. E. Block, chairman of the board of the Inland Steel Company, stated that its activities are now running at 90 per cent of capacity. He was also confident of the outlook. Horce S. Wilkinson, president of the Crucible Steel Company, placed his company's operations at about 80 per cent of capacity. George M. Verity, chairman of the board of the American Rolling Mill Company, predicted an average year for the steel industry in 1930. Hayward Neidringhaus, vice-president and general manager of the Granite City Steel Company, expects improvement in July. His company is now operating at 70 per cent of capacity.

New Canadian Tariff Favors British Tools

By Our Canadian Correspondent

Numerous changes affecting the tariff on machinery and machine tools, and particularly encouraging to the importation of British manufactures, are provided for in the Canadian Budget which was brought down in the House of Commons on May 1.

The machinery section of the Tariff has been reworded and re-classified in a radical manner as regards arrangement and with certain alterations in rates. In agricultural machinery, all items are made free under the British preferential tariff and such tractors as do not now enter free are reduced under all tariffs. Complete parts of all tractors are reduced under all tariffs.

In mining machinery, the items have been revised in accordance with views expressed by both manufacturers and consumers at sittings of the Tariff Advisory Board. Material reductions under all tariffs have been made in machinery and equipment for use in printing, and the entire list is made free under the British preferential tariff. Under household machinery, there are numerous reductions: washing machines are made free under the British preferential tariff and reductions under all tariffs; vacuum cleaners and polishers, domestic refrigerators, wringers, and sewing machines are reduced under all tariffs.

Construction machinery and equipment such as road-making machinery is given a definite place in the schedules, is made free under the British preferential tariff, and is reduced under all tariffs.

All other machinery, including engines and boilers and electrical apparatus, is divided into two classes: made in Canada and not made in Canada; the former group is slightly increased under the general tariff; the latter is reduced under all tariffs and made free under the British preference.

Among the miscellaneous iron and steel commodities which will now enter free or under a materially widened British preference are the following: nuts and bolts, screws, tools of precision, containers for food products, bath tubs and lavatory equipment, trucks, drays and sleighs, buggies and cutters, hand pumps, engines for fishing vessels, aircraft and aircraft engines, guns and rifles, and mathematical instruments.

* * *

A.E.C. to Take Own Census

More than 100,000 professional engineers throughout the United States will be listed by the American Engineering Council, it is announced, in a special census, which, it is believed, will provide one of the most comprehensive cross-sections of the profession yet obtained.

Members of the gear association inspecting the plant of the Cincinnati Milling Machine Company

American Gear Manufacturers Advocate General Standards

AS ANNOUNCED in last week's issue of *American Machinist*, B. F. Waterman, of the Brown & Sharpe Manufacturing Company, was elected president of the American Gear Manufacturers' Association at the 14th annual meeting, held in Cincinnati, May 1-3. E. W. Miller, Fellows Gear Shaper Company, was named first vice-president; and John Christianson, Cincinnati Gear Company, second vice-president. Warren G. Jones, W. A. Jones Foundry & Machine Company, was re-elected treasurer. The appointment of Thomas W. Owen as secretary was continued.

Mr. Jones was also elected a member of the executive committee, as were: A. F. Cooke, Gears & Forgings, Inc., retiring president; F. W. England, Illinois Tool Works; and A. A. Ross, General Electric Company. Henry E. Eberhardt, Newark Gear Cutting Machine Company, was made an honorary member of the executive committee for life. The Hartford (Conn.) Special Machine Company was admitted to membership.

A large part of the meetings was devoted to committee reports, headed by that of Mr. Waterman, who for many years has been chairman of the general standardization committee. Acceptance was given the report of the worm gear committee presented by W. H. Himes, Westinghouse Electric & Manufacturing Company, in which suggested standards for worm gear nomenclature were proposed. Suggestions for a revision of gear symbols and abbreviations were made in a paper presented by A. H. Candee, Gleason Works, and were received favorably. Because the paper opened up such a wide field for investigation, however, it was decided that the nomenclature committee should review, as a whole, all tentative and proposed standards and prepare a general revision in conjunction with representatives of the A.S.M.E. and the American Standards Association. In the discussion it was brought out that there are two classes of people interested in symbols and abbreviations, technical men who use algebraic calculations, and manufacturers who are interested chiefly in specifications, and that an attempt to compromise these interests would be futile; hence, symbols for the former, and abbreviations for the latter should be used.

In presenting the report of the herringbone gear committee, A. A. Ross pointed out the difficulty of arriving at any standards because the inherent characteristics of each of the three types of equipment used to cut such gears were such that what was an ideal tooth proportion for one was unsuited to the other. In connection with non-metallic gearing, some novel recommendations were made by Earle Buckingham in a report read by H. R. Moyer, chairman of the non-metallic gearing group.

Voluminous tables of 14½-deg. spur gear ratings had been developed by the spur gear committee, but these were returned for revision because of certain inconsistencies and limited coverage.

Emil Dukes, chief engineer, Gears & Forgings, presented a mathematical analysis of contact conditions between a roller and plate and between two rollers, and indicated that at a later meeting he would show the application of these formulas to worm gear problems.

There were several talks not directly concerned with gear problems. One of them was an illustrated lecture on the photo-electric cell by L. R. Koller of the General Electric Co., another a discussion of the present economic trend, by Prof. W. P. Calhoun, University of Cincinnati; a brief talk by Fred A. Gier, president, Cincinnati Milling Machine Co.; and finally an address by Ernest F. Du Brul, general manager, National Tool Builders' Association, on "The Outlook for New Developments in the Machine Tool Industry."

Other events of the meeting were a luncheon given the delegates at the Gibson Hotel by the Formica Insulation Company, and a Formica inspection trip.

The Highest Tariff in American History —How About Trade Practice Codes?

By Paul Wooton
Washington Correspondent

WASHINGTON, D. C., May 14—Now is the time to do a little quiet thinking about the tariff. At this late legislative stage, there is nothing to do about it, but, as the final events pass in review, there are a few facts to be remembered. This is the highest tariff in American history. It is a true test of protectionism. Its full effect will not be felt for two or three years—until after the business slump and the dumping of goods in anticipation of higher rates have been adjusted and until the full force of foreign reaction has been brought to bear. At that time it will be more evident whether the thousand economists or the majority of Congress are right about this thing.

Meanwhile there is one fact about the new tariff which can not be emphasized too much. That is the principle, formerly avoided, of giving high protection to raw materials as well as to manufactured goods. The 1922 tariff was devised in response to hysteria accompanying a general business depression. The 1930 tariff is in response to an agricultural depression with the general slump simply a coincidence. Thus the raw material duties have been spread on lavishly with the idea of helping the farmer.

But the manufacturer gets his tariff increase by these same raises in the form of compensatory duties.

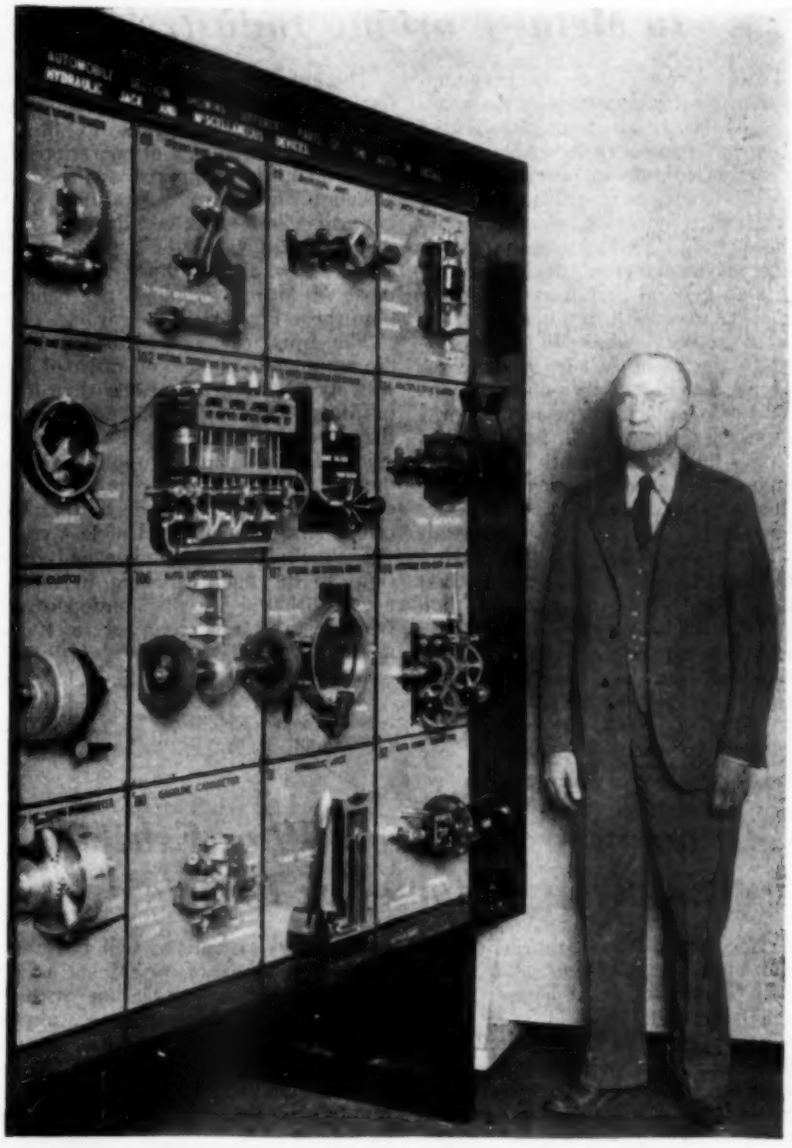
In practical terms, if one admits the protective principle, the 1922 tariff has not been bad as tariffs go. It has provided revenue without being an embargo. Imports of protective commodities have increased much faster than population. Aside from the slump, the 1922 tariff has some sort of justification in the higher price level. It is well enough known that the index, taking 1913-14 as 100, rose to 230 in 1921 and fell off abruptly to 150 where it has remained. The 1922 tariff may be considered as an adjustment to meet in part this 50 per cent increase. But there is no index excuse for the new tariff. This increase on raw materials must be viewed as an untried experiment of very doubtful benefit to agriculture. Its results will bear the close attention of business men through the next two or three years.

Industrial groups operating under trade practice codes approved by the Federal Trade Commission have cast their lot with law enforcement. Instead of protesting against the Commission's evident intention to check the tendency toward liberal interpretation of the anti-trust laws, they have asked simply that the Commission should grant them a hearing before changing rules previously adopted with the Commission's sanction.

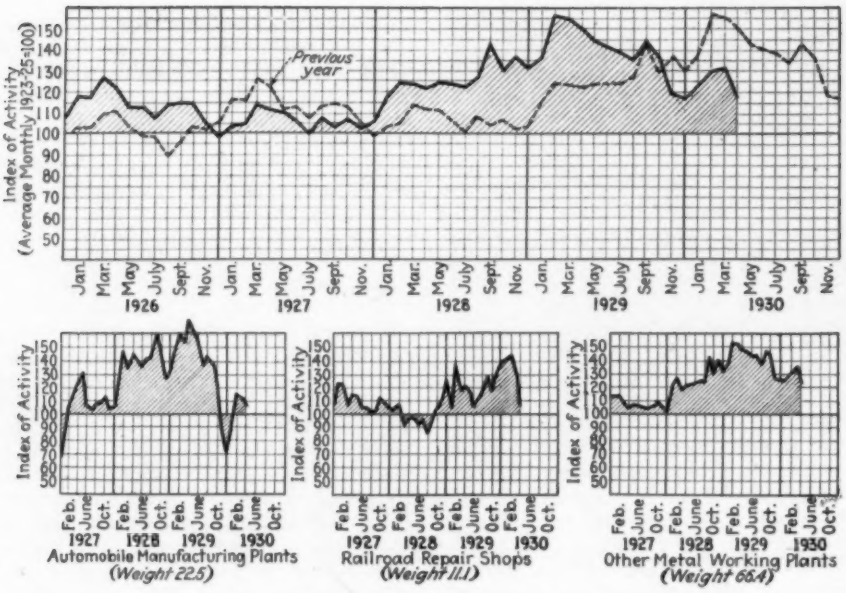
Inasmuch as the adoption of a code of trade practices represents a voluntary and frequently painful effort by an industry, the groups attempting to obtain observance of such codes feel that in fairness the Commission should give them advance notice (30 days) that a change in rules is contemplated and that this change will not be made until they have presented their views.

A plain and honest voicing of Canadian thought against the United States tariff was given during the afternoon session of the U. S. Chamber meeting on May 1, by Lieut. Col. J. H. Woods, president of the Canadian Chamber of Commerce. Pointing out the unfortunate part that political ineptitude has played in breaking down the natural economic unity of the two nations, he stated that the proposed tariff is about to cut Canadian trade by 75 millions of dollars annually. This means a reduction of 20 per cent in Canada's trade with the United States which runs in the neighborhood of 400 millions. Obviously, our exports to Canada (which aggregate 800 millions, or twice as much as the imports) will also suffer.

A machine tool appropriation of $1,500,000 is provided in the bill for the Naval Bureau of Yards & Docks now slated for early and probably favorable action. The same sum, considered a nominal replacement expense, was advanced last year; but for several years prior to that, the Bureau has been operating on considerably less for its machine tool purchases. During the next fiscal year, the funds available will be used on approximately the same schedule as last year for lathes, milling machines, woodworking machines, and similar industrial tools.



W. M. Clark, inventor and builder, beside one of the ten sections of the mechanical motion exhibit which opened at the Newark (N. J.) Museum on May 13. Louis Bamberger is the donor



Downward Trend of Operations In Metal-Working Industry

REPORTS received on the consumption of electrical energy by manufacturing plants in all branches of the metal-working industry indicate a materially decreased rate of operations during April. Only a few metal-working plants reported increased operations during the month. While the basic returns are not as yet complete, the downward trend is so general that it is certain no material change will be made in the index of activity when all plants included in the monthly survey have reported. A decrease in rate of operations normally takes place in the metal-working industry during April, but the drop in activity during the month just closed is some 7 per cent greater than that which would normally be expected.

The rate of operations for the metal-working industry as a whole during April was 10.3 per cent less than that of March and 21.4 per cent less than that of April last year. April activity in the industry was practically the same as reported for last December, low month in the present industrial recession. Current April activity is the lowest for that month since 1927.

The automobile manufacturing industry, including the manufacture of parts and accessories, appears to have a slightly decreased rate of operations during April, as compared with March, although increased operations would normally be expected during April. April operations in these plants appear to have been about 4.9 per cent less than those of March and 36.8 per cent less than those of April last year.

The April rate of operations outside the automobile plants and railroad shops was about 10.1 per cent less than it was in March, and was 16.8 per cent less than that of April, 1929. Activity in railroad repair shops dropped materially during April, reaching a point 20.6 per cent below that of March and 11.7 per cent below that of April of last year.

Following are the indexes of operations in the metal-working industry as a whole, based on consumption of electrical energy and referred to 1923-25 as 100.

April, 1930	117.9
March, 1930	131.5
February, 1930	130.0
April, 1929	150.0

* * * *

Automotive Engineers Plan Exhibits Showing Automotive Progress

PLANS for the celebration of the 25th anniversary of the S.A.E., to be held at French Lick Springs Hotel, French Lick, Ind., from May 25 to 29, include a presentation of a number of historic motor cars and accessories, displays of early automotive advertising, and a showing of photographs and editorial accounts of outstanding automotive events which have occurred in the past 25 years.

More than 1,200 automotive engineers and executives will be present, including scores of prominent officials who can claim association with the motor industry since the early nineties. Among the several hundred exhibits will be contributions loaned by the Smithsonian Institution, including the Manly aeronautical engine, several models of early internal combustion engines; the famous "999" racer and other museum pieces loaned by Henry Ford; a number of round-the-world cars, old steam cars, cars of "ancient vintage" from such factories as Franklin, Hupmobile, Peerless, Oldsmobile, Thomas, White, Packard, Pierce, Locomobile, Reo, Buick, Cadillac, Studebaker; the original motor hand-built by Orville and Wilbur Wright and utilized in some of the very early flights; the early Curtiss motorcycle which still holds the world's record, several Curtiss-Wright engines; a number of early trucks, and an interesting display of tires, bearings, steering gears, axles, engines, transmissions, starting devices, lighting systems and the like; a dirigible and also a model of the latest 6,500,000 cu.ft. passenger airship now in process of manufacture by the Goodyear Company.

Thirty French engineers representing the Societe des Ingenieurs de L'Automobile will be present. A number of Government officials from the Department of Commerce and the Bureau of Standards, representatives of the Army and Navy, and the various automotive and aeronautical associations have signified their intention to be present. A caravan of motorized soldiery from Camp Holabird under the command of Colonel Edgar S. Stayer has altered its itinerary so as to be present for three days of the session. They will bring with them the historic limousine which General Pershing used at the front, as well as a number of other interesting vehicles, including a complete electric light plant and field kitchen on wheels. Diesel engine vehicles will also be shown.

* * *

Deere Units Plan for Year

Directors and officers of Deere & Co., Moline, Ill., were re-elected at the annual meeting last week at which the change in capital structure of the corporation, announced several weeks ago, was formally approved. Officers of the company are: William Butterworth, chairman of the board; Charles Deere Wiman, president; Burton F. Peck, Frank Silloway and C. C. Webber, vice-presidents; George W. Crampton, treasurer; T. F. Wharton, secretary and comptroller; Dwight Deere Wiman, Fred H. Cooper, and Maurice Block, assistant secretaries.

Gray iron foundry capacity of the John Deere Plow Works will be increased 50 per cent upon completion of two new units, contract for which was let this week, at approximately $100,000. A 125-foot extension will be constructed to the high building at Third Ave. and Fourteenth St. and to the west of the present group of foundry buildings, an 80x80 one-story unit will be erected to provide additional room for finishing gray castings. Three famous landmarks in the Deere development will be razed to make way for the new structures, including the last of the original John Deere foundry group built in 1847.

The John Deere Tractor Co. has announced plans for construction of a

group of buildings at a cost of $250,000 this summer which will supply all wheels used in the tractor production of the plant, A. H. Head has announced. The new buildings will add 68,320 sq.ft. floor space. The three principal buildings will be 280x160, 240x80, and 80x20 ft., all one-story, modern factory construction with a two-story cupola building, 40x34 feet.

* * * *

Machinery in Our Pacific Possessions

By Fred H. Colvin
Editor, American Machinist

AS IN China and other undeveloped countries of the Orient, the market for machine tools and similar equipment in the Philippines is confined to the industries in which repairs to machinery of various kinds are necessary from time to time. This at present means the large sugar centrals, saw mills, power plants, and railways and other transportation facilities. In addition, there are a few shoe manufacturing shops, while cigar factories use a few tools on repair work. Ship and bus repairs come under the head of transportation.

Although these markets are not large and are more or less spasmodic, they afford a fair business over an extended period. Just at present, however, orders for a large amount of machinery of various kinds are being held up to await the outcome of the present political agitation. Foreign capital naturally fears the effects of a radical change in government, as it always affects business badly for a time, regardless of the final outcome. Nor is this fear confined to foreign capital. Native Filipinos with heavy investments seem no more anxious for independence than the foreign residents, indicating that here as elsewhere capital prefers stability under existing conditions to changes that may disturb the economic situation. The desire for independence, on the other hand, seems to be born in these peoples also, and will doubtless bring about changes in time. Business men, meanwhile, desire knowledge as to the policy to be pursued so as to shape their businesses accordingly.

Somewhat similar conditions exist in Honolulu, so far as the market for machinery is concerned. The disturbing question of governmental policy is, of course, absent, and there is no fear of a radical political change. The sugar mills and the steam and street railway shops furnish considerable repair work. Add to this the steamship repairs and the building of some new sugar mill equipment, and we have a very respectable total, without mentioning the growing amount of repairs for motor vehicles. None of this work, however, requires modern production machinery, and there seems to be no limit to the longevity of standard machine equipment on work of this kind. Obsolescence is a word that has little meaning in most repair shops, regardless of the depreciation that is charged off year after year. Nearly all concerns report business as being only fair.

Building is going on well in Honolulu, however, and as steel construction enters largely into all but small buildings, this activity is reflected in the machine shops. One feature is the rapid increase in the use there of welding in steel construction.

Standards Meetings Scheduled Soon

A general conference of manufacturers and users of pressure and vacuum gages has been called by the American Standards Association to determine whether these interests favor the establishment of a national standard for such gages. The conference will be held in the Engineering Societies Bldg., 29 West 39th St., New York, on Thursday, May 15.

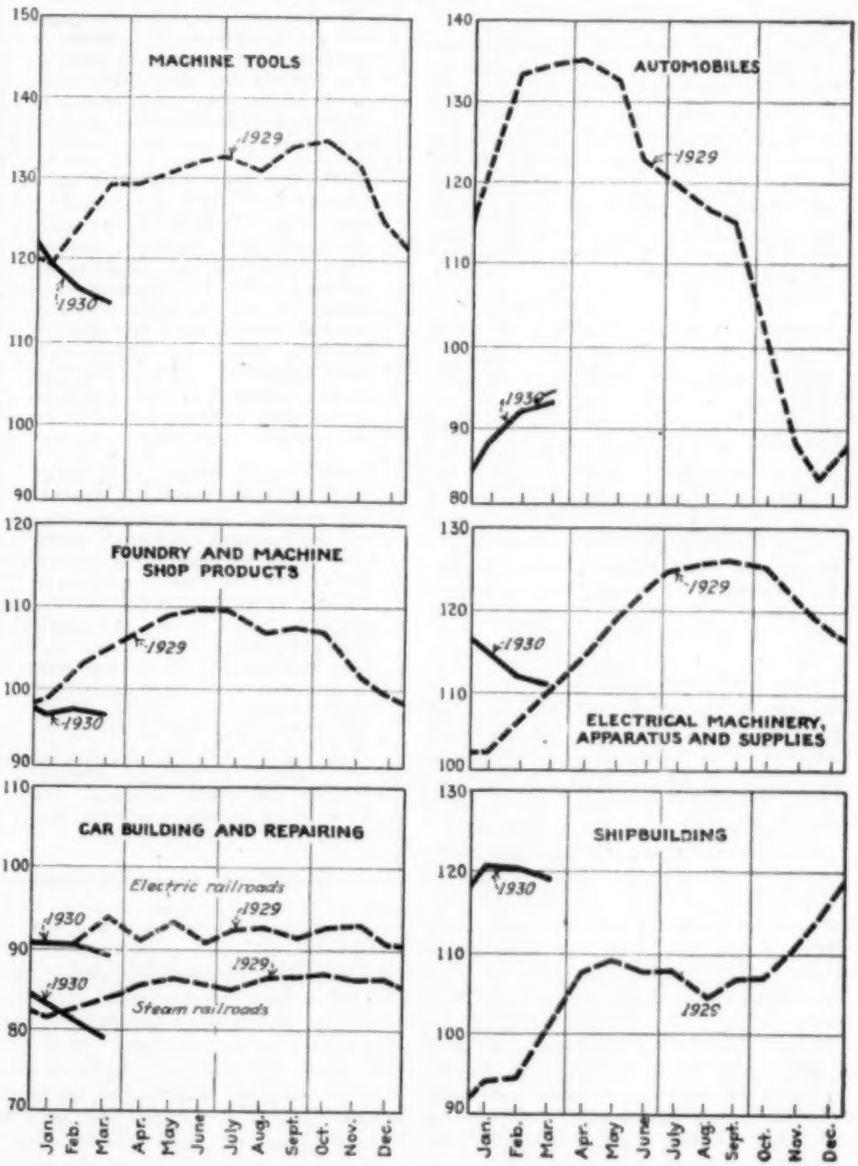
A general conference on the simplification of screw jacks to be held in Room 1769, 608 South Dearborn St., Chicago, on Tuesday, May 20, has been called.

* * * *

Trend of Employment in the Metal-Working Industries

Data Supplied by the Bureau of Labor Statistics

Monthly average for 1926 = 100



BUSINESS · BAROMETER

Commodity price level is expected to affect the course of business during the summer and autumn

By THEODORE H. PRICE
Editor, Commerce and Finance, New York

WHEN it is nearly empty a teakettle often appears to be boiling harder than when it is full. This homely illustration is suggested by the action of last week's stock market after the break had spent its force. Professional operators turned it up and down. Sometimes they succeeded in depressing prices, but a recovery ensued whenever the pressure was relaxed, and the net changes of the week are not so great as might be supposed from the scare heads published in the newspapers. The truth is that the public has become used to a super-excited stock market, and is no longer satisfied by what was regarded as normal.

The fluctuations recorded from day to day are not, however, symptomatic of any important change in the outlook. The public does not expect another boom, and has now prepared itself for the decreased earnings recently shown by many corporations. It is disappointed that business has recovered more slowly than was expected, but it is not deluding itself by believing that things are better than they are.

Therefore, there is little of a bearish character to discount, and it is quite possible that the accidental or the unexpected may favor the bulls in the near future.

Money is the cheapest in years, and there is no stringency in sight. Liquidation of accumulated stocks of most manufactured goods, such as automobiles and tires, has gone a long way since the first of the year. The staple commodities are so low that any further decline of importance seems unlikely, and present prices ought to attract consumers as well as speculators.

Railroad earnings show a sharp reduction as compared with last year, but it has been discounted. Net profits of 200 industrial corporations during the first quarter averaged about 19 per cent less than those of last year, but no competent observer expected otherwise.

Distributive trade is probably subnormal. Department store sales in April, as reported by the Federal Reserve Board, were 8 per cent more than those of last year, but the late Easter destroys the comparison, and for this year to date they have been 4 per cent less.

Copper has been cut another half-cent a pound, but even at 12½ cents, buyers are a little reluctant to purchase large quantities, and the market control that the larger producers exercise seems temporarily impotent.

From this page the reader will get a quick picture of current business and industry. The boxed material below is a summary of the letters from regional correspondents of the American Machinist, published in full on the opposite page.

QUIETNESS is evident in machinery and machine-tool markets throughout the country. Such sales as are being made are principally for replacement purposes. The used-tool market is showing a little more activity, perhaps a forerunner of greater interest in the demand for new tools. The flood of inquiries has slackened slightly, but this occasions no concern.

NEW ENGLAND reported good sales of used tools, not so good on new ones. Buffalo dealers were optimistic, with bettered employment conditions and plentiful inquiries. Chicago inquiries had fallen off and the week was featureless, except for a few sales to railroads and some unimportant local industrial items. The Cincinnati market was dull, but sufficient orders were on hand to keep the manufacturers busy.

CANADIAN buying was better, with industrial conditions improving steadily there. Indianapolis, on the contrary, reported poorer conditions, although these are expected to be only temporary. Southern District sales were fair, inquiries were quiet, and small tool sales were more active. The New York and Detroit markets were spotty and inclined to quietness. Both markets had a better atmosphere than they had earlier in the month, but no unusual buying was being done, nor was any indicated in the immediate future. The New York used-tool market was better.

The steel industry is about as it was, but if trade testimony is accurate, production is due to decline and a comparatively quiet summer is in prospect. Automobile manufacturers hope that their sales will justify a slight increase in their summer output, but in recent weeks most of the expansion reported has been confined to the cheaper cars.

In the commodity markets the operations of the Federal Farm Board in cotton and wheat command most of the attention. July cotton is still an enigma, pending the liquidation of the contracts held by the co-operatives for July delivery. New crop futures are, however, getting down to a figure that is commencing to attract bargain hunters, for the failure to accomplish much acreage reduction is probably discounted when they approach 14 cents, and cheap cotton bought at this time usually shows a profit during the crop-scare season.

President Hoover's address before the United States Chamber of Commerce attracted wide attention. Its optimism was reassuring, but there are many who feel that the wish was father to the thought of better times, and that business won't get on an even keel again until the farmers are assured of a fair price for the crops that will be harvested during the latter half of the year.

For this reason the action of the Federal Farm Board will be watched with the keenest interest. If it is successful in its efforts to protect the farmer against the slings and arrows of outrageous fortune, it will have achieved what many regard as impossible.

Therefore, it is not too much to say that the course of business during the summer and autumn will be acutely responsive to the commodity price level, and that a revival of American trade will probably be seen if our farmers are put in a position to realize a fair price for their exportable production surplus.

The same thing may be said of the stock market. Although its vagaries may sometimes seem eccentric, it is also likely to improve if the harvest season is one that makes the farmers cheerful and increases their purchasing power.

Private advices indicate that Gandhi's arrest is not to be taken too seriously, and there is nothing to indicate that the British Government is more gravely disturbed by the recent developments than it was by the numerous uprisings in India that have from time to time succeeded the Sepoy Rebellion of 1857.

Of course, the Gandhi movement is regrettable, but it was hardly preventable, and the British seem to be dealing very sagaciously with the crisis that it has created. In neither the Occident nor the Orient is there anything that seems to preclude a normal business and a normal increase in commercial activity during the coming summer and autumn.

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THE INDUSTRIAL REVIEW

Weekly progress of the machinery and machine-tool business

THE following reports, gathered from the various machinery and machine-tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

NEW ENGLAND

Special sales of used plant equipment in various sections of Connecticut and Massachusetts have improved the situation for used-machinery dealers. Some very fine tools were included, and the better units brought a keener interest to this market. The improved assortment of machines apparent in most stocks is expected to bring quick buyers.

Orders for new tools during the week were for replacement. The caliber of buying that spells real progress has not yet begun. Inquiries have shown companies to be planning machines capable of higher production, but directors feel the right time has not been reached for capital commitments.

General reports would indicate the April volume of machine-tool sales in the New England territory was no better than the March total. A number of houses did better in April than March, but they were largely those that had not improved their sales totals during the preceding month.

BUFFALO

While reports from the machine-tool dealers vary considerably, it seems quite clear that business generally is on the upgrade and there is every indication that it will so continue into the summer. Local employment conditions are better than at any time this year, and a variety of purchases are being made, chiefly by the smaller concerns.

Inquiries are quite plentiful now, but it is difficult to determine just how much business will result from them. As one dealer pointed out, inquiries are often plentiful during periods of depression with executives afraid to order but nevertheless looking forward to the time when their business will justify the placing of orders.

Electrical equipment dealers and manufacturers' representatives are far from enthusiastic about business.

CHICAGO

Such activity in the machine-tool market as has been noted during the last week is less encouraging than that previously reported. Inquiries have fallen off to a considerable degree, and such sales as have been effected have been of minor importance. With the exception of the closing of a few railroad items, and the meeting of some unimportant local industrial requirements, the week has been without special features. May, thus far, is behind the corresponding period in April, and unless there should develop from new and unexpected sources a demand for shop equipment of various kinds, it is believed by forward looking machinery men that the month's total will be disappointing. The first four months of 1930, according to some who have made comparisons with last year's figures, show a falling off in sales varying from 15 to 25 per cent. This, however, is outside of buying by railroad, farm implement, and tractor interests, whose business is reported to have shown very little recession as compared with that of the same period of last year. Demand for used tools in good condition is moderately active.

CINCINNATI

With very few exceptions, the machine-tool manufacturers of the Cincinnati district report that the general market was very dull the past week, with sales at a low point. Business on hand and coming in is sufficient to sustain manufacture at a fairly good level, however, and so far there has been no material reduction of output, taking the industry as a whole. Deliveries of standard tools are prompt, as a rule, and special tools are being constructed without undue delay.

With about one-half of the manufacturers there was a falling off of inquiries in the week and with the remainder there was no material change in this respect. The major portion of the inquiries received were from general machinists and miscellaneous users, located in all sections of the country, whose requirements were single tools and replacements.

Selling agents had a dull week, finding the market in local and adjacent territory very sluggish. Their sales were largely confined to single tools and replacements, the purchasers being miscellaneous small users.

CANADA

Conditions in the machinery and machine-tool market in Canada have shown some improvement during the last fortnight. A better demand for skilled factory workers is indicative of a general increase in manufacturing activity. Electrical equipment manufacturers are fairly busy, and plants producing mining machinery, and hydro-electric equipment are operating on larger schedules than they were a year ago at this period. Producers of farm equipment, except tractors, are not in such a fortunate position. Automobile production is picking up steadily. Canadian factories produced 669 cars per day during March, an increase of 114 cars a day over the February average. The March output of 20,730 cars was double that of January.

INDIANAPOLIS

For the most part machinery and machine-tool business hit the toboggan here during the last two weeks. Many dealers and manufacturers report conditions extremely difficult and sales hard to make. It is believed this is a temporary situation and will be remedied during the summer months. Just now, however, there is every indication that users are curtailing expenditures.

There are, however, some spots that are not so dull. There is a continued demand for building equipment, particularly for road building. Most of the contractors have started to work, and such demand as is seen is for immediate delivery. There is some demand for equipment to be used in the building construction industry, but this is not as heavy as it was this time last year.

SOUTHERN DISTRICT

Fair sales of new and used machinery and machine tools were reported in this district the past fortnight, predicated largely on scattered buying. The Houston area continues to offer the source of greatest inquiry. Most industrial activity, supplemented by field work, seems to be centered about that Texas city. The situation there has been favorably felt as far east as New Orleans, where some orders have been filled. The north Louisiana district continues active in oil and gas production and many new riggings are being set up throughout the north and central portions of the state as well as at Jackson (Miss.) where recent developments in natural gas have been encouraging.

Relatively little inquiry has been made by the railroads, while shipyards and electric power plants have done some buying. The Birmingham district, while somewhat quieter than might be desired, has shown improvement. The Gulf Coast section and points throughout Florida are stagnant, with small inquiry for used tools in the Jacksonville district.

Small tool sales are most active, and deliveries, which were the source of greatest annoyance five months ago, are satisfactory. Prices for both new and used machinery and machine-tools are holding up well, although there is a tendency to create larger used stocks as replacement and "trade-in" orders are received.

NEW YORK

Quietness characterized the machinery and machine-tool market in the New York district during the past week. While orders continued to come in in about the same volume as for a week or two preceding, they were all for immediate replacement, and few indications of immediate new business were developing. One dealer handling a line of heavy equipment for structural fabrication reported several sales to structural companies, and also a substantial order from an aircraft company. There is also some buying being done by the Navy for Pacific Coast yards. One dealer reports a striking increase in boring mill sales since the beginning of the year. Though other sales have dropped off, he has sold more boring mills so far this year than he did all of last year. Several Boards of Education are beginning their annual buying. Used tools are selling well.

Inquiries are spotty. Most of them are simply in preparation for buying which may come later. The New York Central is inquiring for a 30-in. lathe, but other railroads are not in the market. The change-over from inquiring to ordering is not expected before the middle of the summer, according to present indications.

DETROIT

The machinery and machine-tool market in Detroit is still spotty and sales are lower than they were during March and April. Only a few scattered orders have been received within the past ten days. Though the atmosphere seems to be better than it was during the early part of May, there are few substantial indications that business is actually improving.

The favorable atmosphere seems to be due largely to the fact that employment in the large factories is picking up steadily. There is also more employment outside the factories.

One dealer reports that several large deals are in immediate prospect and that business amounting to $500,000 will probably be involved. Many programs are being planned by plants outside of the automobile industry but it is impossible to tell when they will be carried forward.

The general level of business in the machinery trade is considerably below the high point of last year and is well below the average. Some of the dealers report that conditions are worse than they have been in many years and they are unable to see any likelihood of an early change. This is not a general view, however, some of the outstanding organizations being of the opinion that an improvement will come by the middle of summer.

Business Items

The Canadian National Railway Co., is carrying out a five-year construction program at its Point St. Charles yards, embracing improvements in the locomotive, power house, cast iron foundry, repair, machine, freight, and passenger shops. Last year the new locomotive shop was put in commission; this year a grey iron foundry, material storage midway with overhead crane facilities, and a light repair shop are contemplated. In 1931 the construction of a new passenger shop will be undertaken, and a large machine shop and wood mill for car repairs is scheduled for 1932; while a freight car shop will wind up the program.

The Earl Aviation Corporation, Los Angeles, Calif., has leased factory space in Glendale, Calif., and is proceeding with intensive design work and production studies prior to the quantity production of a sport biplane, the "Populair." Chaffee Earl is chairman of the board, and J. Danner Bunch is president and chief engineer of the Earl company. This concern occupies 10,000 sq.ft. of floor space at the present time.

Stockholders of the Machined Steel Castings Co., Alliance, Ohio, added J. P. Allen of Pittsburgh, former president and general manager of the Union Steel Castings Co., now retired, to the board at their recent meeting. Other members of the board are: C. S. Hoover of Cleveland, W. H. Purcell, W. E. Trump, Fred Donaldson, J. B. Freer, F. E. Dussel, F. A. Carter, and Robert Purcell, all of Alliance.

The State Machinery Co., Inc., 521 Illinois Bldg., Indianapolis, Ind., has been appointed representative of Baker Brothers, Inc., Toledo, Ohio, in the Indiana territory. The company will cover the entire state with the exception of the northern tier of counties which are handled from the Chicago office. E. L. Peltier, formerly with the sales organization of the Vonnegut Machinery Co., is president.

The Surface Combustion Co., Toledo, Ohio, has announced that the Pittsburgh branch of the company and the office of the Mantle Recuperator division will be consolidated and will occupy new offices at 617-619 Henry W. Oliver Bldg. There will be no change in personnel. A. L. Hollinger remains Pittsburgh manager for Surface Combustion industrial equipment and G. D. Mantle will be in charge of recuperator sales.

The Thompson Motor Car Co., Muscatine, Iowa, will begin quantity production of its "Littlemac" auto on May 15, according to Sam Block, vice-president and general manager. The company plans erection of its own factory on the 30-acre tract recently acquired on Stewart road.

The Keystone Steel & Wire Co., Peoria, Ill., has announced initial steps in a building program at Bartonsville, its plant headquarters, which will ultimately mean expenditure of more than $1,000,000 in investments. First of the new buildings will be a $100,000 warehouse of steel construction, one-story high, with 100,000 sq.ft. of floor space.

Homer Strong & Co., 285 State St., Rochester, N. Y., and Ellicott Square Bldg., Buffalo, has been appointed by the Porter-Cable Machine Co., Syracuse, N. Y., as exclusive representative in Western New York. Charles A. Carpenter, Park Bldg., Pittsburgh, has been appointed representative of the Porter-Cable company in the Pittsburgh territory.

The Abrasive Co., Tacony & Fraley Sts., Philadelphia, is planning an exhibition of high-speed grinding at the Foundry Show in connection with the convention of the A.F.A. this week. Among the men in attendance will be W. A. McMillan, A. Dobson, I. R. Blair, H. P. Sherk, J. H. Murphy, J. F. Fischer, and W. D. Sharpe.

Fleet Aircraft of Canada, Ltd., has been organized recently with a Dominion charter in Canada, and a contract has been let for the construction of a Canadian plant at Fort Erie, Ontario. Foundations have already been laid and practically all of the steel work is at the site ready for raising.

Cutler-Hammer, Inc., has acquired the assets of the Union Electric Manufacturing Co., Milwaukee. Branch sales offices and warehouse stocks of the companies will be consolidated immediately and warehouses and the present Union Electric factory will be operated as a manufacturing division of the Cutler-Hammer Company. E. F. LeNoir, president of Union Electric, becomes a member of the headquarters sales staff of the Cutler-Hammer company.

The Crawford Oven Co., is building a new office and factory at 200 Shelton Ave., New Haven, Conn. The first unit will be a single story plant of concrete, brick, and steel. Property recently acquired provides for considerable additional expansion.

The Link-Belt Co., Chicago, has moved its Baltimore (Md.) office to 913 Lexington Bldg. H. D. Alexander is in charge of the office, and Harry E. Reese handles the sales of transmission equipment.

H. D. Conkey & Co., Mendota, Ill., have changed the name of their manufacturing division to the Conco Crane & Engineering Works division of H. D. Conkey & Company.

The National Bronze Co., St. Laurent, Quebec, subsidiary of Robert Mitchell Co., Ltd., Montreal, has opened a new foundry with a capacity of 30,000 castings a day.

The Federal Mogul Corporation, Detroit, Mich., has expanded its group insurance program to provide more than 400 employees with health and non-occupational accident protection.

The Sabine Supply Co., has opened a Houston (Texas) branch at 3200 Navigation Blvd., according to an announcement by W. W. Plowden, vice-president and general manager.

The General Electric Co., Schenectady, N. Y., is occupying booths 532 and 533 at the American Foundrymen's Convention being held in Cleveland. Several new industrial control devices will be on exhibition, and T. H. Reeves will be the representative in charge.

The Stocker-Rumely-Wachs Co., 117-21 North Jefferson St., Chicago, has become Wachs, Gregg & Co. No changes in management or representation were made.

The Burke Stoker & Manufacturing Co., Chicago, has been incorporated with $100,000 capital to deal in machinery and appliances.

The Brown Instrument Co., Philadelphia, Pa., has consolidated its Chicago sales office and its Midwestern factory branch in new quarters at 155 E. Superior Street.

Frank B. Murphy, Builders Exchange Bldg., Cleveland, has been appointed district representative for the Pittsburgh Tube Co., on the sale of standard pipe.

Personals

VICTOR C. BELL has resigned as chairman of the board of the Moto Meter Gauge & Equipment Corporation, Long Island City, N. Y. The office has been abolished, making the president the presiding officer at future meetings.

E. H. BOLLENBACHER, 725 Forsyth Bldg., Atlanta, Ga., has been appointed Atlanta sales representative of the Pennsylvania Pump & Compressor Co., Easton, Pennsylvania.

A. W. BROWN, president of the Hall & Brown Woodworking Machine Co., St. Louis, has been elected vice-president of the National Association of Manufacturers of Woodworking Machinery.

J. C. DAVIS, purchasing agent for the Reliance Electric & Engineering Co., Cleveland, has been elected president of the Purchasing Agents' Association of Cleveland. Mr. Davis has been identified with the association for some time and has been purchasing agent of the Reliance company for 15 years.

G. M. EATON, formerly connected with Molybdenum Corporation of America, Pittsburgh, was recently appointed director of research of the Spang, Chalfant Co., Ambridge, Pennsylvania.

J. H. GERKENS has been elected a director of the Willys-Overland Co., Toledo, Ohio, to succeed H. C. TILLOTSON, resigned. Other officers and directors were re-elected.

RICHARD J. JACKER, Pleasant Ridge, Ohio, has patented a device rotatably mounted on both the driving shaft and driven shaft of a machine, so arranged that the driven shaft will make one

revolution to ten revolutions of the driving shaft in starting. As the driven shaft gains momentum, the ratio of speed between the two shafts will change automatically until they rotate in unison, at which time the casing will rotate with both shafts and act as a flywheel.

WILLIAM MACDONALD, executive vice-president of the United Engineering Co., and manager of the company's woodworking department, San Francisco, recently celebrated his 30th anniversary with the company.

J. A. MARCHANT, formerly with Gilbert, Marchant & Co., London and New York, has become associated with Philipp Bros. Inc., New York.

C. D. MCCORMICK, formerly assistant advertising manager of the C. F. Pease Co., 813 North Franklin St., Chicago, has been appointed advertising manager to succeed W. EARLE PASHLEY, who is now second vice-president and assistant sales manager.

PAUL J. NUTTING has been elected president of the Lee Foundry & Machine Co., Plymouth, Mich., to succeed H. S. LEE, resigned. JOHN COLE was named sales manager of the newly established sales office in the Lexington Bldg., Detroit.

N. GEORGE PETINOT, assistant to the president of the Vanadium Corporation of America, New York, returned from Europe on April 30 on the S.S. *Paris*. He will sail again for France after a month's stay in this country.

EDWARD S. RIDGEWAY has resigned as vice-president in charge of sales for the Meadows Manufacturing Co., Bloomington, Ill., to enter business for himself in Bloomington, it was announced last week. E. R. BRIDGE, assistant sales manager for some time, has been appointed new manager of sales and C. K. WOODIN has been made assistant to SAMUEL SIDDALL, vice-president and general manager.

MAX ROTTER, vice-president of the Busch-Sulzer Bros. Diesel Engine Co., St. Louis, spoke on "The Diesel Engine Situation Today" at a meeting of leading engineers, under the auspices of four engineering societies, in the auditorium of the Interior Department, in Washington, D. C., May 8. Other speakers were E. NIBBS, chief engineer of the New London Ship & Engine Works of the Electric Boat Co., Groton, Conn., whose subject was "Diesel Engines for Submarines," and O. D. TRIEBER, president of the Trieber Diesel Engine Co., Trenton, N. J., who spoke on "Lightweight Diesel Engines."

ALAN M. SCAIFE was recently elected president of William B. Scaife & Sons Co., Pittsburgh. He succeeds his father, the late JAMES VERNER SCAIFE and has been succeeded as vice-president by his brother, JAMES V. SCAIFE, Jr.

WILLIAM H. TODD, president of the Todd Shipyards Corporation, New York, sailed for Europe on the *Leviathan* on May 3, to attend the annual meeting of his London company, Todd Oil Burners Ltd., and to attend to other business.

J. E. RUSHMORE, formerly general superintendent of the Scranton (Pa.) and Rome (N. Y.) plants of the Wrought Iron Co. of America, Philadelphia, has been appointed general superintendent of all works in full charge of operations.

S. R. WILLIAMS has joined the sales staff of the Toronto office of the General Supply Co. of Canada, Ltd. Mr. Williams was formerly on the sales staff of the Ontario Tractor Co., Ltd., Toronto.

Obituaries

WILLIAM L. ABBOTT, 77, former chairman of the board of directors of the Carnegie Steel Co., Pittsburgh, died on May 2 at Mayfair House, New York City.

LOUIS BROWN, 68, formerly president of the Oil Well Supply Co., Pittsburgh, and a chairman of the board of directors until his retirement on Jan. 1, 1929, died on May 2 at his home in Pittsburgh.

WILBUR B. HALL, 70, hardware manufacturer of Meriden, Conn., died on May 6 at his residence in that city, after a two months' illness.

W. C. REITZ, 75, vice-president and treasurer, a director, and one of the organizers of the Pittsburgh Steel Co., died at his home in Pittsburgh on May 3.

GEORGE B. SHEPARD, 65, president of the Eberhard Manufacturing Co., Cleveland, died in that city on May 2. He had been ill about two months.

WILLIAM C. TEAGAN, 63, vice-president of the Carty & Moore Engineering Co., died recently in Detroit.

GEORGE S. WAITE, 63, formerly manager of the White Sewing Machine Co., Cleveland, died in that city on April 29. Mr. Waite for many years was connected with the Grant Motor Co., and also with the White Co., Cleveland.

Forthcoming Meetings

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Fifth national aeronautic meeting, May 19-21, Dayton, Ohio, and Wright field. Calvin W. Rice, 29 West 39th St., New York, is secretary.

NATIONAL FOREIGN TRADE COUNCIL—Convention at Hotel Biltmore, Los Angeles, May 21-23. O. K. Davis, 1 Hanover Square, New York City, is secretary.

SOCIETY OF AUTOMOTIVE ENGINEERS—1930 Summer Meeting, French Lick Springs Hotel, French Lick Springs, Ind., May 25-29. National headquarters are at the Engineering Societies Bldg., 29 W. 39th St., New York City.

ASSOCIATED MACHINE TOOL DEALERS—Meeting at Granville Inn, Granville, Ohio, June 4 to 5. A. G. Bryant, 2558 West 16th St., Chicago, is secretary.

NATIONAL ASSOCIATION OF FOREMEN—Convention at Toledo, Ohio, June 6-7. Harry J. Baumker, 316 Tenth St., Toledo, is convention secretary.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS — Semi-annual meeting, Hotel Book-Cadillac, Detroit, June 9 to 12. Calvin W. Rice, 29 West 39th St., New York City, is secretary.

NATIONAL ASSOCIATION OF PURCHASING AGENTS—Fifteenth annual convention, Stevens Hotel, Chicago, June 16-19, "Inform-A-Show" in conjunction. G. A. Renard, 11 Park Place, New York City, is secretary-treasurer.

STEEL INDUSTRY'S EXECUTIVES—Annual Iron & Steel Exposition. Under the sponsorship of the Iron & Steel Electrical Engineers, June 16-20, Broadway Auditorium, Buffalo, N. Y. John F. Kelly, 1010 Empire Bldg., Pittsburgh, Pa., is managing director.

WORLD POWER CONFERENCE—Second annual conference, Berlin, Germany, June 16-25. O. C. Merrill, Edmonds Bldg., Washington, is U. S. chairman.

AMERICAN SOCIETY FOR TESTING MATERIALS—Annual meeting, Haddon Hall, Atlantic City, N. J. June 23-27. C. L. Warwick, 1315 Spruce Street, Philadelphia, is secretary-treasurer.

STEEL FOUNDERS' SOCIETY OF AMERICA—Semi-annual convention, Greenbrier Hotel, White Sulphur Springs, Va., June 26-27. G. P. Rogers, 932 Graybar Bldg., New York City, is managing director.

INTERNATIONAL CONGRESS FOR GENERAL MECHANICS — Liege, Belgium, Aug. 31 to Sept. 7. For information address Alb. Schlag, 4 Place Saint Lumbert, Liege, Belgium.

NATIONAL METAL CONGRESS—Twelfth annual Congress and Exposition, Stevens Hotel, Chicago, Sept 22-26. W. H. Eisenman, secretary of the A.S.S.T., 7016 Euclid Ave., Cleveland, Ohio, is director.

AMERICAN WELDING SOCIETY—Annual fall meeting, Congress Hotel, Chicago, September 22-26. W. M. Spraragen, 29 W. 39th St., New York, N. Y. is technical secretary.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Annual fall meeting of Iron & Steel Division and Machine Shop Practice Division, Stevens Hotel, Chicago, September 22-26. P. T. Wetter, 29 W. 39th St., New York, secretary.

AMERICAN INSTITUTE OF MINING & METALLURGICAL ENGINEERS — Annual fall meeting of Iron & Steel Division, Stevens Hotel, Chicago, September 22-26. T. T. Read, 29 W. 39th St., New York, N. Y., is secretary.

AMERICAN INSTITUTE OF MINING & METALLURGICAL ENGINEERS — Annual fall meeting of the Institute of Metals Division, Stevens Hotel, Chicago, September 22-26. W. M. Corse, 29 W. 39th St., New York, N. Y., is secretary.

AMERICAN SOCIETY FOR STEEL TREATING—Annual Convention, Stevens Hotel, Chicago, September 22-26. W. H. Eischman, 7016 Euclid Ave., Cleveland.

THE WEEKLY PRICE GUIDE . . .

Rise and Fall of the Market

THERE would be little steel business of importance in the present market were it not for heavy tonnages of pipe now being booked. Demand for automotive, building and railway material is as dull as it might be, were this month July instead of May. Prices of all metals tend downward in keeping with those of commodities in general. This week, the most important of the declines occurred in pig iron, tin, zinc, solder and babbitt metal.

(All prices as of May 9, 1930)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern (silicon 1.75@2.25)	$16.69@$18.19
Northern Basic	19.89@ 20.39
Southern Ohio No. 2	19.89@ 20.39
NEW YORK—Tidewater Delivery	
No. 2 Southern (silicon 1.75@2.25)	18.00@ 18.50
BIRMINGHAM	
No. 2 Foundry (silicon 1.75@2.25)	14.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	20.00
Virginia No. 2	18.75@ 19.25
Basic	22.29
CHICAGO	
No. 2 Foundry, local (silicon 1.75@2.25)	19.00
No. 2 Foundry, Southern (silicon 1.75@2.25)	18.20
PITTSBURGH, including freight charge ($1.76) from Valley:	
No. 2 Foundry	19.63@ 20.13
Basic	19.63@ 20.13
Bessemer	20.76

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.50
Cleveland	5.00
Cincinnati	4.50
New York	5.25
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots:

Blue Annealed*	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	1.80@1.90	3.35†	3.25	3.50@3.60†
No. 12	1.85@1.95	3.45†	3.30	3.55@3.65†
No. 14	1.95@2.05	3.55†	3.40	3.60@3.70†
No. 16	2.05@2.15	3.65†	3.50	3.70@3.80†
Black				
Nos. 18 to 20	2.45	3.85†	3.55	3.45@3.70
No. 22	2.60	4.00†	3.70	3.60@3.85
No. 24	2.65	4.05†	3.75	3.65@3.90
No. 26	2.75	4.15†	3.85	3.75@4.00
No. 28	2.90	4.75†	4.00	3.90@4.15
Galvanized				
No. 10	2.60	3.90†	3.80	3.55@3.80
Nos. 12 to 14	2.70	4.00†	3.90	3.65@3.90
No. 16	2.80	4.10†	4.00	3.75@4.00
No. 18	2.95	4.25†	4.15	3.90@4.15
No. 20	3.10	4.40†	4.30	4.05@4.30
No. 22	3.15	4.45†	4.35	4.10@4.35
No. 24	3.30	4.60†	4.50	4.25@4.50
No. 26	3.55	4.85†	4.75	4.50@4.75
No. 28	3.80	5.10†	5.00	4.75@5.00

*Light Plates. † Up to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. butt	56.02%	43.48%	53.3%	42.3%	57.3%	44.8%
3½ to 6 in. lap	52. 6%	40.06%	53.3%	40.3%	53.9%	41.4%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	Diameter in Inches—External	Diameter in Inches—Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28
8	2.50	8.625	8.071	.277

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb.:

Thickness—Decimal	B.w.g. and Fractions	Outside Diameter in Inches—¼	⅜	½	⅝	¾	1	1¼	1½
		Price per Foot							
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23	
.049"	18	.17	.18	.19	.20	.21	.23	.25	
.065"	16	.19	.20	.21	.22	.23	.25	.27	
.083"	14	.20	.22	.23	.24	.25	.27	.29	
.095"	13	.21	.23	.25	.26	.27	.29	.31	
.109"	12	.22	.24	.26	.27	.28	.30	.32	
.120" or .125"	11	.23	.25	.27	.28	.29	.31	.33	
.134"	10	.24	.26	.28	.29	.30	.32	.34	

MISCELLANEOUS—Warehouse base prices in cents per lb.:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.25†	4.00	3.75†
Cold rolled strip steel	6.25	6.00	6.10
Floor plates	5.10†	5.30	5.00†
Cold drawn, round or hexagon‡	3.40	3.65	3.60
Cold drawn, flat or square‡	3.90	4.15	4.10
Structural shapes	3.30†	3.00	3.10†
Soft steel bars	3.25†	3.00	3.00†
Soft steel bar shapes	3.25†	3.00	3.00†
Soft steel bands	3.75†	3.65	3.20†
Tank plates	3.30†	3.00	3.10†
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, ¾-in. thick by ¾-in. wide. †Up to 3,999 lb., ordered and released for shipment at one time. ‡Cold finished steel, shafting and screw stock.

Electric welding wire at New York warehouse—$\frac{3}{32}$, 8.35c. per lb.; ⅛, 7.85c. per lb.; $\frac{5}{32}$ to ½, 7.35c. per lb.

METALS

Warehouse Prices in Cents Per Pound for Small Lots:

Copper, electrolytic, New York			15.25
Tin, Straits, pigs, New York			36.50@37.50
Lead, pigs, E. St. Louis	5.40	New York	6.50@ 7.00
Zinc, slabs, E. St. Louis	4.65	New York	6.25@ 7.25

	New York	Cleveland	Chicago
Antimony, slabs	10.25@10.75	11.50	14.50
Copper sheets, base	23.75	22.75	23.75
Copper wire, base	16.00	15.87½	15.87½
Copper, drawn, round, base	22.25	22.25	22.25
Copper tubing, base	26.00	26.00	26.00
Brass sheets, high, base	20.50	20.50	20.50
Brass tubing, high, base	25.50	25.50	25.50
Brass rods, high, base	18.75	18.75	18.75
Brass wire, high, base	21.00	21.00	21.00

SHOP MATERIALS AND SUPPLIES

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%.....	25@26	24.30	24.30
Zinc sheets (casks).....	10.25@11.00	11.75	10.11
Solder (½ and ½).....	26.25	27.50	26@28
Babbitt metal, delivered in case lots, New York, cents per lb.:			
Genuine, highest grade.....			52.00
Commercial genuine, intermediate grade.....			37.00
Anti-friction metal, general service.....			31.00
No. 4 babbitt, f.o.b.....			11.00

NICKEL AND MONEL METAL—Price in cents per lb., base, f.o.b. Huntington, W. Va.:

	Nickel	Monel Metal
Sheets, full finished.....	52.00	42.00
Sheets, cold rolled.....	60.00	50.00
Strip, cold rolled.....	55.00	45.00
Rods, hot rolled.....	45.00	35.00
Rods, cold drawn.....	50.00	40.00
Tubing.....	75.00*	90.00†
Angles, hot rolled.....	50.00	40.00
Plates.....	52.00	42.00

*Seamless. †Welded.

OLD METALS—Dealers' purchasing prices in cents per pound, f.o.b. cars:

	New York	Cleveland	Chicago
Crucible copper.....	11.50@11.75	13.50	10.25@10.75
Copper, heavy, and wire..	10.25@10.50	13.00	9.50@10.00
Copper, light, and bottoms	9.00@ 9.25	12.00	8.75@ 9.25
Heavy lead.....	4.25@ 4.50	5.25	3.50@ 4.00
Tea lead.....	2.25@ 2.50	3.25	2.50@ 3.00
Brass, heavy, yellow....	6.25@ 6.37½	8.00	6.00@ 6.50
Brass, heavy, red.....	9.00@ 9.25	12.50	8.50@ 9.00
Brass, light.....	5.00@ 5.25	7.00	5.00@ 5.50
No. 1 rod-brass turnings.	7.25@ 7.50	8.00	7.00@ 7.50
Zinc.....	2.25@ 2.50	3.00	2.00@ 2.25

TIN PLATES—Charcoal—Bright—Per box:

	New York	Cleveland	Chicago
"AAA" Grade:			
IC, 14x20.....	$12.10	$11.95	$11.50
"A" Grade:			
IC, 14x20.....	9.70	9.90	9.50
Coke Plates—Primes—Per box:			
100-lb., 14x20.....	6.45	6.10	7.00
Terne Plates—8-lb. Coating—Small lots—Per box:			
IC, 14x20.....	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton, waste, white, per lb....	$0.13*	$0.16	$0.15
Cotton waste, colored, per lb....	.09½*	.12	.12
Wiping cloths, washed, white, per lb.....	.12½	38.00 per M	.16
Sal soda, per lb.....	.01½	.02	.02
Roll sulphur, per lb.....	.028	.03½	.04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb.....	.148	.164	.154
Cutting oil, about 25% lard, in 5 gal. cans, per gal.....	.75	.60	.65
Machine oil, medium-bodied (55 gal. steel bbl.) per gal.....	.33	.36	.24
Belting—Present discounts from list in fair quantities (½ doz. rolls) for leather or rubber:			
Leather—List price, 24c. per lin.ft., per inch of width, for single ply:			
Medium grade.....	30–10%	30–10%	35%
Med. grade, heavy wgt.....	30%	30 –5%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft.:			
First grade.....	50%	50–10%	50%
Second grade.....	60%	60– 5%	50–10%

*Grade F.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars.....	per lb.	$0.0325	$0.0325	$0.0325
Cold drawn shafting..	per lb.	.034	.034	.035
Brass rods.....	per lb.	.1875	.2125	.2125
Solder (½ and ½).....	per lb.	.2625	.285	.3225
Cotton waste, white..	per lb.	.13	.13	.10@.13½
Disks, aluminumoxide mineral, cloth, No. 1 6-in. dia.....	per 100	4.59	4.59	3.60
Lard cutting oil.....	per gal.	.75	.75	.55
Machine oil.....	per gal.	.33	.33	.33
Belting, leather, medium.....	off list	30–10%	30–10%	30–10%
Machine bolts, up to 1x30 in., full kegs....	off list	50–10%*	50–10%*	50–10%*

*List prices as of April 1, 1927

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials — Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
Flint paper*.....	$6.03	$6.03	$6.03
Emery cloth*.....	25.87	25.87	25.87
Disks, aluminum oxide mineral, 6 in. dia., No. 1, per 100:			
Paper†.....	2.61	2.61	2.61
Cloth†.....	4.59	4.59	4.59
Fire clay, per 100 lb. bag.....	1.00	.75	.75
Coke, prompt furnace, per net ton....	Connellsville,		2.60
Coke, prompt foundry, per net ton....	Connellsville,		3.50@4.85
White lead, dry.....	100 lb. kegs...	New York,	13.75
White lead, in oil.....	100 lb. kegs...	New York,	14.25
Red lead, dry.....	100 lb. kegs...	New York,	13.75
Red lead, in oil.....	100 lb. kegs...	New York,	15.25

*Less than 3 reams. †Less than 200.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

Machine bolts:	
Up to ¾-in. x 6-in., full kegs, list less.....	60%
Larger, up to 1 x 30-in., full kegs, list less.....	50–10%
Less than full kegs or case lots, add to list.....	10%
Fitting-up bolts: list less.....	45%
Lag screws::	
Up to ½-in. x 6-in., list less.....	60%
Larger, list less.....	50–10%
Less than full keg or case lots, add to list.....	10%
Rivets:	
Structural, round head, full kegs, net.....	$4.50
Structural, round head, broken kegs, net.....	6.00
Tank, $\frac{7}{16}$-in. dia. and smaller, list less.....	60%
Nuts:	
Hot pressed, square or hexagonal, blank or tapped:	
Full kegs up to 1-in., incl., list less.....	60%
Larger, up to 3-in., list less.....	40–10%
Less than keg or case lots, add to list.....	10%
Washers:	
Wrought, full kegs, per 100 lb., list less.....	$4.00
Wrought, broken kegs, per 100 lb., list less.....	2.00
Turnbuckles:	
With stub ends, list less.....	20%
Without stub ends, list less.....	50%
Chain:	
Proof coil, base, per 100 lb., net.....	$8.50
Cast iron welding flux, per lb., net.....	.35
Bronzing flux, per lb., net.....	.50

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Equipment Wanted

Conn., New Milford — School Commission, Town Hall—woodworking and machine shop equipment for proposed 2 story, 65 x 145 ft. school. Estimated cost $150,000.

O., Dayton—Radio Products Co., West 5th St., D. E. Johnson, Pres.—automatic machine, grinder, air compressor, etc., for factory.

O., East Palestine—Adamson Mfg. Co., C. F. Adamson, Prop.—automatic chucking machine, drill press, air compressor and motor for plant to replace fire loss.

Ore., Portland—C. B. Ertz, Contr.—lathes, auto tools, etc., for proposed 1 story, 134 x 200 ft. garage and shop at 16th and Sandy Blvd. $40,000. R. B. Loyd, owner, Chrysler Auto Co., c/o H. W. Lyon, lessee.

Ont., Hamilton—Gordon Steel Works, Ltd., Main St. W., W. S. Gordon, Mgr.—machinery and equipment for the manufacture of steel plate equipment for paper mills, also tanks, sheet steel, etc., for recently acquired plant.

Ont., Welland — Pyramid Supply Co., 140 Delaware Ave., Buffalo, N. Y.—machinery and equipment for the manufacture of tools for proposed factory at Victoria and Garner Aves., here.

Opportunities for Future Business

Calif., Los Angeles—Cambria Spring Co., 915 Santee St., awarded contract for the construction of a 1 and 2 story, 60 x 150 ft. factory at 12th and San Julian Sts.

Calif., San Francisco—Granfields Inc., Geary St., awarded contract for the construction of a service station at 12th and Mission Sts. Estimated cost $75,000.

Calif., Stockton—Le Tourneau Mfg. Co., Moss St., plans the construction of a factory for the manufacture of road building equipment at North Wilson Way. Estimated cost to exceed $40,000.

Conn., Meriden—City, C. C. Thompson, Supt. of Schools, will receive bids until May 19 for the construction of a 2 story, 60 x 250 and 50 x 50 ft. trade school on Pleasant St. Estimated cost $175,000. L. Hamilton, 22 Church St., Archt.

Conn., New Haven—Municipal Airport Commission, is receiving bids for the construction of an airport including hangar, shops, etc., at Thomason Ave. and Morris Cove. Estimated cost $325,000. Westcott & Mapes, 139 Orange St., Archts.

Mass., Boston—Shopper's Garage, c/o Jordan Marsh & Co., 450 Washington St., plans extensive alterations to 6 story garage at 16 Beach St. Private plans.

Mass., Brockton—F. W. Murdock, 56 West Elm St., is having preliminary plans prepared for a 1 story garage and service station. Estimated cost $50,000. W. F. Barlow, 232 Main St., Archt.

Mass., Cambridge (Boston P. O.)—G. Kramer, 844 Main St., is having preliminary plans prepared for the construction of a garage on Massachusetts Ave. Estimated cost $200,000. E. T. P. Graham, 171 Newbury St., Boston, Archt. Noted Feb. 13.

Mass., Dorchester (Boston P. O.)—S. Price, 168 Summer St., East Boston, awarded contract for a 1 story, 45 x 120 ft. service station repair shop, etc., at 405 Columbia Rd., here. Estimated cost $50,000. Noted Oct. 3.

Mass., Swampscott — Town, H. S. Baldwin, Chn. Bldg. Com., Town Hall, is having preliminary plans prepared for the construction of a 2 story high school, including manual training rooms, etc., at Phillips Park, Humphrey St. Estimated cost $500,000. Cram & Ferguson, 248 Boylston St., Boston, Archts. Noted Apr. 24.

Mass., Springfield—Chapman Valve Co., Pine St., Indian Orchard, is receiving bids for the construction of a steel foundry and valve shop on Pineville St. Estimated cost $50,000. McClintock & Craig, 458 Bridge St., Archts. Noted May 8.

Mass., Watertown—C. H. Hodge, 68 Massachusetts Ave., is receiving bids for a 1 story service garage on North Beacon St. Estimated cost $45,000. Private plans.

Mass., West Springfield (br. Springfield) — General Motors Truck Co., 781 Worthington St., will soon award contract for the construction of a 2 and 3 story, 125 x 175 ft. service station at Agawam and Connecticut Aves. Estimated cost $125,000. H. C. Hearne, 1387 Main St., Springfield, Archt.

Mo., St. Louis—W. G. Shelton Co., 17th and St. Charles Sts., is having plans prepared for a 3 story factory for the manufacture of marcel waving machines and other electrical devices on Olive and Beaumont Sts. Estimated cost $100,000. A. J. Widmer & Associates, Inc., 1217 Fullerton Bldg., Engrs.

Mo., St. Louis — Washington University, Skinker and Forsythe Blvds., is having preliminary plans prepared for additions, including civil engineering and mechanical and electrical engineering departments. Estimated total cost $600,000. Jamieson & Spearl, 1116 Arcade Bldg., Archts.

N. J., Elizabeth—Thomas & Betts Co., 36 Butler St., manufacturers of electrical supplies, awarded contract for a 3 story, 80 x 180 ft. factory. Estimated cost $150,000.

N. J., Jersey City—Jersey City Ladder Co., Inc., 677 Montgomery St., is having plans prepared for a 2 story, 45 x 140 ft. factory at Crawfoot Ave. Estimated cost $40,000. B. Singer, 921 Bergen Ave., Archt.

N. J., Kearny—Western Electric Co., Inc., O. C. Spurling, Lincoln Highway, will not construct factory buildings 40E, 41 and 42 on Central Ave. $500,000. Project indefinitely in abeyance. Noted May 1.

N. J., Linden—Commercial Steel Equipment Corp., 1024 Elizabeth Ave., is having revised plans prepared for the construction of a 1 story factory. Estimated cost $40,000. A. J. Silberstein, 868 Broad St., Newark, Archt. Noted Apr. 24.

N. J., Moonachie — General Motors Corp., Broadway and 57th St., New York, N. Y., plans the construction of an airport, including hangars, machine shops, etc., here. Estimated cost $150,000. Architect not selected.

N. J., Newark—J. Black, 246 Central Ave., is having revised plans prepared for a 2 story auto radiator shop and garage at 268-274 Central Ave. Estimated cost $40,000. M. A. Wolf, 845 Broad St., Archt. Noted Apr. 10.

N. J., Passaic—H. Schielting, Jr., 38 Broadway, is receiving bids for a 1 story, 25 x 100 ft. work shop at Black Oak St. Estimated cost $40,000. B. J. Bellay, 625 Main Ave., Archt.

N. Y., Astoria — Diljo Corp., 31-11 Grand Ave., will receive bids about Sept. 1 for the construction of a service garage. Work will be done by separate contracts. Noted Dec. 26.

N. Y., Forest Hills—A. S. Walker, 41 150th St., Jamaica, is having sketches made for a 2 story, 100 x 107 ft. garage at Dartmouth St. and Yellowstone Ave. Estimated cost $70,000. Private plans.

N. Y., Jamaica—Krug Baking Co., 139-01 95th Ave., awarded contract for the construction of a garage, service station and distribution plant at 94th Ave. and 138th Pl. Estimated cost $75,000. Noted Apr. 24.

N. Y., Long Island City—Charlin Realty Co., 163-18 Jamaica Ave., Jamaica, is having sketches made for the construction of a garage at 44th St. and 25th Ave. Estimated cost $70,000. M. Klein, 65 Court St., Brooklyn, Archt.

N. Y., Long Island City—Ritter Swensen, 4127 29th St., awarded contract for the construction of a garage and service station. Estimated cost to exceed $40,000.

N. Y., New York — Halpern Construction Corp., 450 East Fordham Rd., is having sketches made for a 2 story, 100 x 100 ft. garage and service station at 172nd St. and Jerome Ave. Estimated cost $70,000. G. W. Swiller, 4215 3rd Ave., Archt.

N. Y., New York—E. Ornstein, 1293 Lexington Ave., plans the construction of a garage and service station at 164 East 87th St. Estimated cost to exceed $100,000.

N. Y., New York—Seven Hundred Forty Greenwich St., Corp., M. Wallanstein, Pres., 33 West 42nd St., Pres., is having sketches made for the construction of a 4 story, 82 x 92 ft. garage at 738 Greenwich St. Estimated cost $100,000. G. G. Miller, 545 5th Ave., Archt.

O., Celina—Celina Mfg. Co., manufacturers of metal products, awarded contract for the construction of a 1 story, 90 x 340 ft. factory. Estimated cost $40,000.

O., Cleveland—Euclid Machine & Engineering Co., A. C. Smeller, 1838 Noble Rd., awarded contract for a 1 story, 70 x 100 ft. factory, boiler room, etc. Estimated cost $50,000. Noted Apr. 24.

O., Cleveland—E. F. Hauserman Co., 6800 Grant Ave., manufacturers of steel partitions, had plans prepared for a 2 story, 80 x 270 ft. factory at 6800 Grant Ave. Estimated cost $150,000. G. S. Rider Co., Marshall Bldg., Archt.

O., Cleveland—Lake Erie Forge & Machine Co., J. A. Markey, V. Pres., 1533 University Rd., awarded contract for a 1 story, 50 x 110 ft. forge shop. Estimated cost $40,000.

O., Cleveland—Lamson & Sessions Co., F. C. Case, Chn. of Bd., 1971 West 85th St., manufacturers of bolts and nuts, is having preliminary plans prepared for addition to factory. Estimated cost $80,000. G. S. Rider Co., Marshall Bldg., Archt.

O., Cleveland—Saginaw Bay Lumber Co., C. W. Prescott, Pres., 2106 West Third St., plans to rebuild lumber mill, warehouse, etc., destroyed by fire. Private plans.

O., Cleveland—U. S. Air Compressor Co., 5300 Harvard Ave., is receiving bids for a 1 story, 100 x 150 ft. addition to factory. Estimated cost $60,000. G. S. Rider Co., Marshall Bldg., Archt.

O., East Liverpool — Patterson Foundry & Machine Co., plans the construction of a factory including electric furnace, electric annealing ovens, etc., on East End St. Estimated cost $50,000. Private plans.

Pa., Beaver Falls—Babcock & Wilcox Co., Singer Bldg., New York, N. Y., H. H. Murray, Supt., Beaver Falls, is receiving bids for a 2 story, 50 x 225 ft. factory for the manufacture of boiler tubes. Ingham & Boyd, 1211 Empire Bldg., Pittsburgh, Archts.

Pa., Philadelphia — Broun Instrument Co., Roberts and Wayne Sts., plans a 2 story, 79 x 219 ft. addition to factory. Ballinger & Co., 12th and Chestnut Sts., Archts.

Pa., Romeville—Pennzoil Co., Drake Theatre Bldg., Oil City, awarded contract for 1 story, 60 x 120 ft. car, blacksmith, welding, electric repair and carpentry shops, here.

Pa., Titusville—Titusville Iron Works, J. T. Dillon, Sr. Pres. and Gen. Mgr., awarded contract for a 1 and 2 story, 50 x 150 ft. foundry. Estimated cost $200,000. Private plans.

R. I., Newport—Shore Line Bus Co., W. H. Vanderbilt, Pres., is having plans prepared for a bus terminal including repair facilities on Spring St. Estimated cost $40,000. J. G. Stevens, 25 Bull St., Archt.

Tex., San Antonio—A. B. C. Garage, c/o B. Phelps, Pecan St., is having plans prepared for a 100 x 200 ft. garage at Solead and Travis Sts. Private plans.

Vt., Barre—K. J. Kirk, c/o Morey & Coe, Barre, Archts., awarded contract for a 1 story repair and service garage at Pearl and Summer Sts. Estimated cost $40,000.

Vt., White River Junction—Vermont Baking Co., 31 North St., awarded contract for a 1 and 2 story garage, repair shop and storage building. Estimated cost $40,000.

Wash., Bellingham—Puget Sound Power & Light Co., Stuart Bldg., Seattle, awarded contract for the construction of a 1 story, 97 x 135 ft. service building here. Estimated cost $40,000. Noted May 1.

Wis., Milwaukee—Crucible Steel Casting Co., 12th St. and Oklahoma Ave., awarded contract for a 1 story, 97 x 134 ft. foundry, at 15th St. and Oklahoma Ave.

Wis., Milwaukee—G. H. Smith Steel Casting Co., 500 Clinton St., awarded contract for the construction of a 149 x 202 ft. factory at Chase and Holt Sts.

Wis., Milwaukee—Walters & Sons Inc., c/o La Croix & Memmler, 228 3rd St., Archts., are receiving bids for a 1 story, 65 x 924 and 60 x 74 ft. garage on Appleton St.

Wis., West Allis—Allis Chalmers Co., awarded contract for a 1 story, 45 x 300 ft. factory on Greenfield St. Private plans. Noted Apr. 24.

Ont., St. Thomas—St. Thomas Stamping & Enameling Co. Ltd., plans alterations and additions to enameling plant, including three new enameling kilns, etc. Estimated cost $100,000. J. T. Finlay, 430 Talbot St., Archt.

Ont., Welland—Page-Hersey Tubes Ltd., 100 Church St., Toronto, plans the construction of a 1 and 2 story factory for the manufacture of tubes, pipes, etc. Estimated cost $2,000,000. Private plans. Noted Apr. 10.

Que., Montreal—Dominion Gears Ltd., plans addition to plant on Wellington St. Estimated cost $100,000.